DOCUMENT RESUME

ED 321 077 CE 055 192

AUTHOR	Lee, Howard D.
TITLE	Thinking Skills and Coaching Strategies Workshop (Menomonie, Wisconsin, January 18-20, 1989). Final Report.
INSTITUTION	Wisconsin Univ. - Stout, Menomonie. Center for Vocational, Technical and Adult Education.
SPONS AGENCY	Wisconsin State Board of Vocational, Technical, and Adult Education, Madison.
PUB DATE	Jun 89
GRANT	30-109-150-239
NOTE	180p.; For related documents, see CE 055 193-194 and CE 055 196-199.
AVAILABLE FROM	Center for Vocational, Technical and Adult Education, 218 Applied Arts Bldg., University of Wisconsin-Stout, Menomonie, WI 54751.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC08 Plus Postage.
DESCRIPTORS	Cooperative Programs; *Critical Thinking; Discovery Processes; *Divergent Thinking; *Inservice Teacher Education; Logical Thinking; *Metacognition; Postsecondary Education; Problem Solving; Productive Thinking; Secondary Education; *Thinking Skills; Vocational Education
IDENTIFIERS	*Wisconsin

ABSTRACT

This document reports on two 3-day workshops designed to train three vocational education instructors or curriculum developers from every Wisconsin school district in specific critical thinking skills strategies that they could implement in their districts. The document includes a three-page narrative description of the workshops that includes their objectives, number of participants, agenda, and summary of evaluation results. The objectives of the first workshop were to form a critical thinking skills advisory committee, identify specific critical thinking strategies, and teach those skills. The second workshop aimed to identify content and format concerns with the advisory committee; identify more skills; determine what strategies were tried in schools, their degree of success, and what technical assistance is needed; and share successful strategies with other participants. The rest of the volume consists of supporting documents, including letters announcing the workshop; a certificate of workshop completion; participant lists; handout materials; forms for feedback from participants; evaluation rating scales; and participant comments. (CML)

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ED321077

Final Report

Workshop Conducted
for
Wisconsin State Board of Vocational, Technical and Adult Education

Center for Vocational, Technical
and Adult Education
University of Wisconsin-Stout
Menomonie, WI 54751

Submitted by Howard D. Lee

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THINKING SKILLS AND COACHING STRATEGIES WORKSHOP

June 1989

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Project #30-109-150-239

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THINKING SKILLS AND COACHING STRATEGIES WORKSHOP
Final Report

The Thinking Skills and Coaching Strategies Workshop was conducted January 18-20, 1989 at the University of Wisconsin-Stout Memorial Student Center. This workshop was based on the needs identified by the first thinking skills workshop conducted June 6-8, 1988. The purpose of the first workshop was to train a team of instructors/ curriculum developers from each VTAE district on specific critical thinking skills strategies. The need for this first workshop was based on the present literature, and the statewide needs assessment results of instructional staff throughout the VTAE system. For the first workshop, each VTAE district was asked to send a team of three faculty members; two general education teachers or a general education and occupation education teacher and the district curriculum developer. These teachers were expected to take the information learned back to their districts and try them out in their classrooms. The curriculum developer was to provide the teachers technical assistance and begin the process of integrating critical thinking skills into the curriculum. The objectives of the first workshop were to:

1. Formulate a critical thinking skills advisory committee.

2. Identify specific critical thinking skills strategies based on a literature review and contact with experts in the field.

3. Conduct a three day workshop to teach specific critical thinking skills to VTAE district teams.

Thirty-seven participants from Wisconsin VTAE Districts, a CESA District, DPI and the State Board of VTAE participated in the first workshop. Evaluations from the workshop were very positive both in terms of content and management of the conference.

At the time the thinking skills workshop was approved a second follow-up workshop was discussed. The intent of this follow-up or Thinking Skills and Coaching Strategies Workshop was to follow-up and support the original team sent by the VTAE districts in their implementation of the thinking skills strategies. The purpose was twofold; share experiences and successes and provide coaching instruction and practice for team members. All original team members were expected to participate in this follow-up workshop and bring one additional vocational staff member. Upon completion of this workshop, participant teams were expected to share critical thinking strategies with district staff members as determined by each district.

The strategy used to integrate critical thinking in the VTAE classroom is to teach the skills directly to teachers who will then try them out in their classroom. The curriculum developer provides the leadership and organizational support to the teachers. By following up the participants with this second workshop, they were able to share their success and thereby reinforce the thinking skills which they learned. In addition, participants were given coaching strategies so they can teach these strategies to instructors in their own district.

The objectives of the Critical Thinking Coaching Workshop were:

1. Meet with the critical thinking skill's advisory committee to identify content and format concerns.

2. Build on skills identified in Workshop I, by Identifying specific thinking skills sharing and coaching strategies based on a literature review and contact with experts in the field.

3. Determine what previous participants tried, how successful they were, and what further assistance is needed.

4. Conduct a two and one half day workshop to share successful implementation strategies and to learn coaching strategies critical to VTAE district teams.

A general notice including the agenda of the workshop was sent to the State Board of VTAE and to all Instructional Services Administrators on December 12, 1988 (see Attachment A). Each district was asked to form or send the original team and send their names to CVTAE.

The workshop was conducted January 18-20, 1989 at the University of Wisconsin-Stout Memorial Student Center. Participants were provided with lunch each day with member districts covering the other expenses. One graduate credit was given to participants if they wanted it. University policy requires that participant; however, pay the graduate segregated fee of $9.64. Most participants selected this option.

Participants were also mailed Certificate of Completion (see Attachment B for sample).

Twenty-six participants from 11 Vocational Technical Colleges participated in the workshop. Two additional participants from CESA 10 also attended. Most of the instructors who attended were from the general education area with three from the technical occupational areas. Two were supervisors and two were curriculum specialists (see Attachment C for participant list).

The agenda consisted of a review of the critical and creative thinking strategies and which strategies work by Ann Mielke, General Education Instructor at Moraine Park Technical College. Kathy Kelly, Staff Development Specialist, White Bear Lake, Minnesota, reviewed the Tactics for Thinking Model, introduced new strategies, discussed implementation of presentations and coaching skills, curriculum, implementation strategies and provided opportunity for team planning. The complete three day agenda is attached (see Attachment D). Participants were also provided with many handouts which were added to the original materials (See Attachment E).

Participants were provided with a review from the June 1988 workshop, some new information on thinking skills, but also some implementation strategies for developing a program in their own setting. A feedback sheet (Attachment F) permitted the presenters to modify their presentation to meet the needs of the participants. Time was provided to permit districts who sent teams to plan a possible program and consider factors of implementation such a program into their school. They were asked to report to the workshop participants and were provided feedback on their plan. Both speakers provided a detailed handout of concepts relating to teaching thinking or factors on implementation.

Evaluation results shows that the workshop was very well received. The tabulated average rating for the 17 evaluation questions was 4.1 out of a possible 5 (see Attachment G). Participant comments are also attached (see Attachment H) and indicate excellent results.

ATTACHMENT A

Letters of Notice

CVTAE
CENTER FOR VOCATIONAL TECHNICAL AND ADULT EDUCATION
715-232-1382

UNIVERSITY OF WISCONSIN
STOUT
MENOMONIE WISCONSIN 54751

MEMO

DATE: December 12, 1988

TO: All Participants Thinking Skills Workshop
June, 1988
UW-Stout

FROM: Howard Lee & Sue Foxwell

RE: THINKING SKILLS AND COACHING WORKSHOP
January 18-20, 1989

The follow-up workshop to the June Thinking Skills Workshop is being planned for January 18-20, 1989, at the UW-Stout Student Center. As participants in workshop I, we wanted you to know that the attached letter went to Instructional Services Directors requesting registration information be sent to us by December 30, 1988. An agenda will then be sent to participants.

We look forward to a great workshop. Hope to see you there.

jrr

UNIVERSITY OF WISCONSIN-STOUT IS AN EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION UNIVERSITY.

CVTAE
CENTER FOR VOCATIONAL TECHNICAL AND ADULT EDUCATION
715-232-1382

UNIVERSITY OF WISCONSIN
STOUT
MENOMONIE, WISCONSIN 54751

«DATA Nonattending Inserts»
December 7, 1988

«line 1»
«line 2»
«line 3»
«line 4»
«line 5»

Dear «name»:

PLEASE RESPOND BY DECEMBER 30, 1988

We have just received word that the State Board of Vocational, Technical and Adult Education has awarded the Center for Vocational, Technical and Adult Education extramural support to conduct a **Thinking Skills and Coaching Strategies Workshop.** This workshop will be held, January 18-20, 1989, at the UW-Stout Student Center. An announcement to District Directors from Dr. Sorensen will be forthcoming. The purpose of this workshop is to:

1. Build on critical thinking skills identified in Workshop I.
2. Introduce new thinking skills.
3. Determine which strategies participants tried, how successful they were and what further assistance is needed.
4. Develop coaching skills to permit participants to share thinking skills strategies with others in their own school.

According to our records, your district did not participate in the first workshop held June 8-10, 1988, at UW-Stout. We would encourage you to send a team which includes a curriculum developer, a general education instructor, and a vocational instructorto this **Thinking Skills and Coaching Strategies Workshop.**

Credit Offered

One credit (either graduate or undergraduate) will be offered with tuition waived. A small UW-System institutional fee (graduate $9.82, undergraduate $12.54) will be the only charge. Registration for credit will occur at the workshop.

The workshop will begin at 8:30 a.m. on Wednesday, January 18, 1989, and conclude at 11:30 a.m. on Friday, January 20, 1989. A detailed agenda will be sent to registered participants prior to the workshop.

The workshop grant will cover Wednesday and Thursday lunch and breaks and the morning break on Friday. Other meal, travel and lodging expenses are the responsibility of each VTAE district. There will be no general registration charge for this workshop.

Please complete the enclosed registration form and return it in the envelope provided by December 30, 1988. We look forward to your involvement in this staff development activity. If you have questions, please contact Sue Foxwell at (715) 232-1885.

Sincerely,

Howard Lee, Co-Director

Sue Foxwell, Workshop Coordinator

Center for Vocational, Technical
and Adult Education
University of Wisconsin-Stout
218 Applied Arts Building
Menomonie, WI 54751

jrr

UNIVERSITY OF WISCONSIN-STOUT IS AN EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION UNIVERSITY.

Instructional Services

Recevied 1988 nonparticipating district letter
dated 12/7/88:

Thomas Maney
Dean of Instruction
Nicolet Technical College
P.O. Box 518
Rhinelander, WI 54501

Allen Ellingson, Assistant Director
Educational Services
Northeast Technical College
2740 West Mason Street, P.O. Box 19042
Green Bay, WI 54307-9042

James Olds, Administrator
Dean of Instructional Services
Southwest Technical College
Route 1, Box 500
Fennimore, WI 53809

Kenneth Mills, Assistant Director
Educational Services
North Central Technical College
1000 Campus Drive
Wausau, WI 54401

Brian Oehler
Assistant District Director
Mid-State Technical College
500 - 32nd Street North
Wisconsin Rapids, WI 54494

Recevied 1988 participating district letter
dated 12/7/88:

William Ihlenfeldt, Assistant Director
Instructional Services
Chippewa Valley Technical College
620 West Clairemont Avenue
Eau Claire, WI 54701

Laurence Schoenberger
Assistant District Director
Waukesha County Area Technical College
800 Main Street
Pewaukee, WI 53072

Philip Thaldorf, Administrator
Instructional Services
Western Wisconsin Technical College
304 North Sixth Street, P.O. Box 908
LaCrosse, WI 54602-0908

Fred Baue, Assistant Director
Instructional Services
Wisconsin Indianhead Technical College
HCR 69, P.O. Box 10B
Shell Lake, WI 54871

Frederick Mitchell, Assistant Director
Instructional Services
Area Technical College District No. 4
3550 Anderson Street
Madison, WI 53704

Karen Knox, Assistant District Director
Instructional Services
Blackhawk Technical College
6004 Prairie Road, P.O. Box 5009
Janesville, WI 53547

Merlin Gentz, Administrator
Instructional Services
Fox Valley Technical College
1825 North Bluemound Road, P.O. Box 2277
Appleton, WI 54913-2277

Ralph Troeller
Educational Services Director
Gateway Technical College
3520 - 30th Avenue, P.O. Box 1486
Racine, WI 53403

Edward Falck, Administrator
Educational Services
Lakeshore Technical College
1290 North Avenue
Cleveland, WI 53015

Phil Langerman
Executive Dean
Milwaukee Area Technical College
700 West State Street
Milwaukee, WI 53233

Betty Brunelle
Assistant Director - Instruction
Moraine Park Technical College
235 North National Avenue
Fond du Lac, WI 54935

CVTAE
CENTER FOR VOCATIONAL TECHNICAL AND ADULT EDUCATION
715-232-1382

UNIVERSITY OF WISCONSIN
STOUT
MENOMONIE WISCONSIN 54751

December 12, 1988

Lou Chinnaswamy, Consultant
WI Board of VTAE
310 Price Place
P.O. Box 7874
Madison, WI 53707

RE: Thinking Skills and Coaching Strategies Worshop
January 18-20, 1989

Dear Lou:

Attached is a suggested letter describing the workshop to be sent out under Dr. Sorensen's signature. Please note that because of the timeline, we have sent workshop information and registration material to previous participants and instructional services directors, noting that this letter from Dr. Sorensen would be forthcoming. A copy of that corresponsdence is enclosed for your information.

We look forward to working with you on this important professional development initiative. Please feel free to contact either myself, (715) 232-2343, or Sue Foxwell, Workshop Program Coordinator, (715) 232-1885, if you have any questions.

Sincerely,

Howard

Howard Lee, Co-Director
Center for Vocational, Technical
and Adult Education

jrr

Enclosure

pc: Jim Urness
Sue Foxwell

UNIVERSITY OF WISCONSIN-STOUT IS AN EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION UNIVERSITY.

Date: December 12, 1988

Subject: Thinking Skills and Coaching Strategies Workshop
January 18-20, 1988, University of Wisconsin-Stout, Menomonie

Contact: Lou Chinnaswamy, Consultant

Distribution: District Directors
Assistant Directors of Instructional Services
Meeting Distribution List

The Wisconsin Board of Vocational, Technical and Adult Education (WBVTAE) is sponsoring a Professional Development Workshop for instructors according to the following design:

Subject: Thinking Skills and Coaching Strategies
Date: January 18-20, 1989
Site: University of Wisconsin-Stout
Student Center
Menomonie, Wisconsin

Background: The WBVTAE encourages the development of initiatives and educational opportunities for professional advancement of educators of the VTAE system through the RFP process. The professional development committee with the assistance of UW-Stout has designed this follow-up thinking skills and coaching strategies workshop for a selected team of educators from each VTAE district.

Objectives of the Workshop: This three-day workshop on Thinking Skills and Coaching Strategies is a follow up of a workshop conducted on the UW-Stout campus in June, 1988. The participants will be guided to build on skills identified in Workshop I by identifying how specific thinking skills and coaching strategies were tried, how successful they were and what further assistance is needed in implementation. The workshop structure will assist the participants in continuing to construct learning activities and implementation strategies that promote higher order thinking skills.

Participants: Each district is requested to select a team of four educators of which one is an alternate member. The same team members which attended Workshop I should attend this follow-up workshop, if possible. If this is not possible, please appoint an alternate. The recommended composition of the team is:

a curriculum specialist,
an instructor from vocational program or discipline area, and
one instructor from general education.

The alternate may be from any one of the disciplines or general education.

Registration and credits: Decisions pertaining to the cost of travel and lodging are to be made by the participants and the parent district. Lunches and breaks will be covered by the project. Housing is available at local area motels. One graduate or undergraduate credit will be available for workshop participants with tuition waived. Credit enrollees are responsible for paying a UW-System institutional fee of $9.82 (graduate) and $12.54 (undergraduate).

Inquiries: Any inquiries should be directed to:

Sue Foxwell, Conference Program Coordinator
Center for Vocational, Technical and Adult Education
UW-Stout
218 Applied Arts Building
Menomonie, WI 54751
(715) 232-1885.

Back-up on information request will be provided by Orville Nelson, (715) 232-1362, Howard Lee, (715) 232-2343, or Lou Chinnaswamy, (608) 266-2222.

Under separate cover, letters have been sent to previous participants and instructional services directors which include workshop and registration information. Districts have been requested to submit registrations by **December 30, 1988,** so final workshop preparations can be made.

Your cooperation for this important professional development initiative is earnestly requested.

Robert P. Sorensen, Ph.D.
State Director

jrr

Enclosure

ATTACHMENT B

Certificate of Completion

Thinking and Coaching Strategies

Certificate of Completion

This is to certify that

Participated in 18 hours of Instruction January 18-20, 1989, at UW-Stout

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CAT

Howard Lee, Project Coordinator

Sue Foxwell, Workshop Coordinator

A project sponsored by the Wisconsin State Board of Vocational, Technical and Adult Education and the
University of Wisconsin-Stout, Center for Vocational, Technical and Adult Education

ATTACHMENT C

Participant List

VTAE Thinking Skills and Coaching Strategies Workshop
Participant List
January 18-20, 1989

District	Participant
Chippewa Valley Technical College 620 West Clairemont Avenue Eau Claire, WI 54701-1098 (715) 833-6200	Charles Cooley, Science-Math Florence Erickson, Nursing Supervisor Sonja Rathbun, Nursing Jill Tallman, Nursing
Gateway Technical College Racine Campus 1001 South Main Street Racine, WI 53403-1582 (414) 631-7304	David Hasenbach, General Education
Elkhorn Campus 400 South Highway H Elkhorn, WI 53121-2020 (414) 723-5390	George Jacobson, General Education
Lakeshore Technical College 1290 North Avenue Cleveland, WI 53015 (414) 458-4183	Marvin Schrader, Curriculum and Research Specialist Fay Shemchak, Reading
Mid-State Technical College 500 - 32nd Street North Wisconsin Rapids, WI 54494 (715) 423-5650	Marge Colby, GOAL Gale Jackson, GOAL Nancy Knapp, GOAL
Moraine Park Technical College 235 North National Avenue, P.O. Box 1940 Fond du Lac, WI 54936-1940 (414) 922-8611	Judy Neill, Curriculum and Instructional Manager
North Central Technical College 1000 Campus Drive Wausau, WI 54401 (715) 675-3331	Rita Baltus, Speech - Psychology
Southwest WI Technical College Bronson Boulevard Fennimore, WI 53809-9989 (608) 822-3262	Cecil Allen, Machine Tool Ronald Coppernoll, Counselor John Gander, Dean of Industrial Occupations
Waukesha County Technical College 800 Main Street Pewaukee, WI 53072 (414) 691-5566	Ingrid Huebner, Placement Specialist Jan Lathrop, Instructional Development Specialist Eldor Teske, Auto Body Repair Instructor Mike Wittig, Program Manager
Western WI Technical College 304 North Sixth Street, P.O. Box 908 La Crosse, WI 54602-0908 (608) 785-9200	Kenneth Balts, General Education Chairperson Eugene Erickson, Sheet Metal and Metal Fabricators Marcia Meshbesher, Technical Nursing
WI Indianhead Technical College HCR 69, Box 10B Shell Lake, WI 54871 (715) 468-2815	George Pratt, General Education/Special Needs
CESA 10 725 West Park Avenue Chippewa Falls, WI 54729 (715) 723-0341	John Cavanaugh, Instructional Services Director Gerald Munyon, LVEC

VTAE Thinking Skills and Coaching Strategies Workshop
Participant List (continued)

District	Participant
UW-Stout Center for Vocational, Technical and Adult Education 218 Applied Arts Building (715) 232-1885	Lolly Baldus, Assistant Researcher Sue Foxwell, Workshop Coordinator Howard Lee, Co-Director
Institute of Professional Renewal White Bear Lake Area School District 624 2399 Cedar Avenue White Bear Lake, MN 55110 (612) 429-5391	Kathy Kelly, Presenter
Moraine Park Technical College 235 North National Avenue, P.O. Box 1940 Fond du Lac, WI 54936-1940 (414) 922-8611	Ann Mielke, Presenter

ATTACHMENT D

Agenda

Wisconsin Board of Vocational, Technical and Adult Education and the Center for Vocational, Technical and Adult Education, University of Wisconsin-Stout

THINKING SKILLS WORKSHOP

June 8, 9, 10, 1988

THINKING SKILLS AND COACHING STRATEGIES WORKSHOP

January 18, 19, 20, 1989

Memorial Student Center

University of Wisconsin-Stout

This Workshop is sponsored through a grant from the Wisconsin State Board of Vocational, Technical and Adult Education.

UW-Stout does not discriminate on the basis of race, sex, age, religion, handicap or national origin.

AGENDA
Thinking Skills and Coaching Strategies Workshop
January 18-20, 1989
UW-Stout Memorial Student Center

Wednesday, January 18, 1989 - Maplewood/Oakwood Rooms

8:00 - 8:30	Registration
8:30 - 9:00	Administrative Actions
9:00 - 10:30	**Review of Critical and Creative Thinking Strategies** Ann Mielke
10:30 - 10:45	Break
10:45 - 12:45	**Review of Critical and Creative Thinking Strategies** (continued)
12:45 - 1:30	Lunch with discussion - Heritage Room
1:30 - 2:15	**Which Strategies Work**
2:15 - 2:30	Break
2:30 - 3:30	**Which Strategies Work** (continued)
3:30	Adjourn

Thursday, January 19, 1989 - Great Hall: North and West Rooms

8:30 - 10:30	• **Review Tactics for Thinking Model** • **New Strategies** • **Lessons** Kathy Kelly
10:30 - 10:45	Break
10:45 - 12:45	• **Review Tactics for Thinking Model** • **New Strategies** • **Lessons** (continued)
12:45 - 1:30	Lunch with discussion - Heritage Room
1:30 - 2:15	**Implementation** • **Presentation skills** • **Coaching skills** • **Curriculum**
2:15 - 2:30	Break
2:30 - 3:30	**Implementation** • **Presentation skills** • **Coaching skills** • **Curriculum** (continued)
3:30	Adjourn

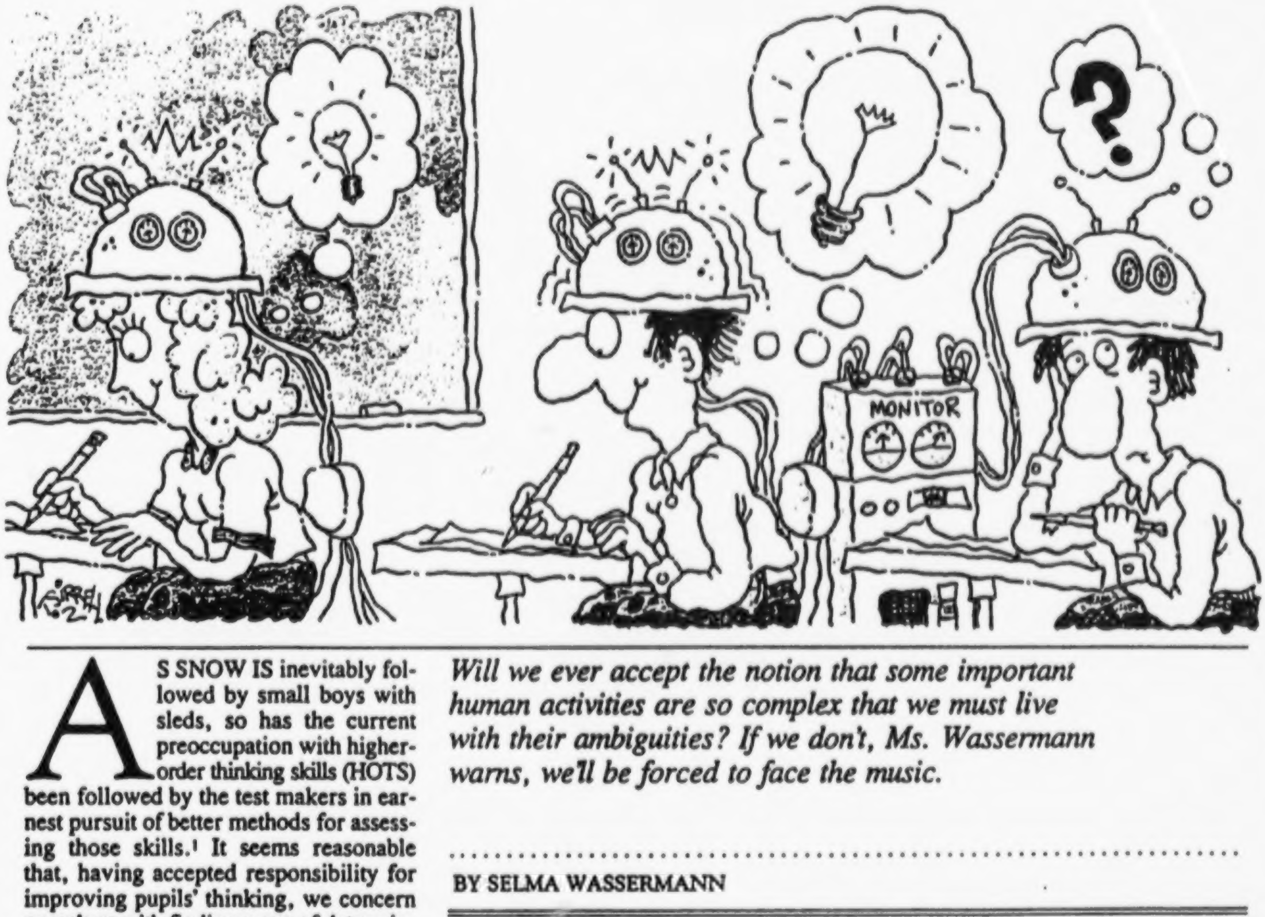
Friday, January 20, 1989 - Great Hall: North and West Rooms

8:30 - 10:30	• **Implementation strategies** • **Team planning** • **Plan**
10:30 - 10:45	Break
10:45 - 12:00	• **Turn in individual district implementation plan** • **Evaluation**

ATTACHMENT E

Notebook Materials

Reflections on Measuring Thinking, While Listening to Mozart's *Jupiter* Symphony



Will we ever accept the notion that some important human activities are so complex that we must live with their ambiguities? If we don't, Ms. Wassermann warns, we'll be forced to face the music.

BY SELMA WASSERMANN

AS SNOW IS inevitably followed by small boys with sleds, so has the current preoccupation with higher-order thinking skills (HOTS) been followed by the test makers in earnest pursuit of better methods for assessing those skills.[1] It seems reasonable that, having accepted responsibility for improving pupils' thinking, we concern ourselves with finding ways of determining to what extent we have been successful. Teach-test-reteach is the backbone of much educational practice. And what we teach and how we assess that teaching have implications not only for our basic understanding of student progress and teacher effectiveness, but also, on a higher plane, for the larger picture of what we want students to become.

Educators have made a deep commitment to the role of measurement in education, in dollars spent (millions and millions); time given over to taking tests (thousands and thousands of hours); energy expended (unquantifiable, but excessive); and value placed on results (for student placement, for scholarships, for honors, for student self-worth). One might reasonably assume, therefore, that educators by and large agree on the ways to evaluate student learning and on which tests are good.

However, that is far from the case. There is probably no other educational practice that is so beset by argument, heated polemics, and conflicting views as evaluation, with each side able to point to its own body of "scientific" research to support its own claims.[2] One would

SELMA WASSERMANN is a professor in the Faculty of Education at Simon Fraser University, Burnaby, B.C.

Illustration by Terry Sirrell

If a caged chimp uses a stick as a tool to pull in a bunch of bananas from outside his cage, is that thinking?

think that evaluation practices might, even in a small way, reflect some of this uncertainty – that we might be more circumspect in our use of classroom evaluation. It is one of the larger ironies that, while the debate rages and while the final verdict is far from decided, measurement practices nevertheless continue in, as Phil Esterhaus would say, "the extre-is."

The concern for teaching students to think has given rise to a concern for the testing of thinking. This new movement, cheekily dubbed HOTS by the acronym makers, seeks an unambiguous picture of what students actually do in the act called *thinking* and wishes to find a standardized way of determining whether that thinking is "good." Such examinations are expected to enable us to determine with considerable authority whether students are moving from LOTS (lower-order thinking skills) to HOTS. We would also be able to translate student performance into a numerical score, allowing us to fix the extent to which students are progressing on the LOTS-to-HOTS scale. If the tests of thinking follow normal school-based patterns, a teacher should quite soon be able to say about a student, "She is thinking up to grade level," just as that same teacher now says, "She is reading up to grade level." Or perhaps, "He is not thinking up to his potential." Or even, "Her thinking skills are measured at 4.1 on the Fonebone Scale of HOTS."

Thinking – the mental capability that we perceive to be an inherently human haracteristic – is such an intriguing subject. We have been preoccupied with this human capability for centuries. Yet, if one thing is clear, it is that even among experts the definitions of what we call thinking vary greatly, from the "phantom cunning and resourcefulness of the mind,"[3] suggesting mysteries and secrets yet to be uncovered, to the computer-like "information processing."[4] Different conceptions of thinking have given rise to such terms as lateral thinking, right-brain thinking, left-brain thinking, linear thinking, metaphoric thinking, critical thinking, cognitive processing, creative thinking, and many others, each representing its own view of the ways in which the human mind functions. Does the mind perform all these mental functions? Or have we yet to determine which of the experts is correct in his or her conceptualization? Having studied thinking for nearly 30 years, I have come to believe that, like mental health or parenting, thinking is probably one of those metaconcepts that is still being explored and about which there remains much to learn.

THERE IS MUCH about thinking that baffles me. For example, my friend and colleague Sylvia Ashton-Warner used to describe her writing process thus: "I feel it surfacing. I try to hold it back, but it has a mind of its own. Finally, I am unable to contain it, so I must give in. I sit at my table, put my fingers on the typewriter keys, look up, and just write what I see." Can this be called thinking?

Eudora Welty described her own writing process in the *New York Times Book Review* as "not knowing" until she actually *wrote* the next sentence "what that sentence would say." She also said that she had been ashamed to admit this to anyone until she read that other writers shared her experience. Can Welty's writing process be called thinking?

When Igor Stravinsky said, "I never think about music – I feel it," was he really thinking nonetheless? When Archimedes made his great intuitive leap and supposedly ran naked through the streets of Syracuse shouting "Eureka," had he been thinking? When the scientists were generating the "life on Mars" experiments, were they thinking? Do any of these ways of thinking have anything in common? How do we know for sure? Such questions continue to titillate and confound me. But these are not the end of my questions about thinking.

If a caged chimp uses a stick as a tool to pull in a bunch of bananas from outside his cage, is he engaged in problem solving? Is that thinking? In the famous "bees experiment" conducted at Princeton University, in what appeared to be a case of the bees outguessing the investigators, were the bees thinking when they "calculated" the position of the next food site before the investigators placed food at the site?[5] These and other questions continue to intrigue me, and, at the risk of being called a slow study, I want to keep my mind open about thinking.

But openness of mind does not necessarily mean being lost in a void of darkness. Studying thinking has led me to a number of important observations:

- Thinking is a highly complex and interrelated set of functions. There doesn't seem to be a clear dividing line between the roles of the conscious and the unconscious mind, or between what we have termed cognitive and affective, or between right-brain and left-brain functioning. There's a lot of work that needs to be done sorting all this out.
- Some acts of thinking can be observed in logical, problem-solving patterns of behavior (e.g., the "life on Mars" experiments). Some come out of highly intuitive, almost magical, insights or intuitive leaps. Some thinkers are capable of operating in both of these ways; some thinkers do their "best" thinking in the concrete, rather than in the intuitive, domain. Who does what and how is still something of a mystery.
- There is a range of performance within each of us with respect to "how we think." We don't do our "best" thinking *all* the time. Many of us do different "kinds of thinking" as a response to different situations. Why our "best" thinking doesn't come automatically when we call on it and how we can bring out that "best" thinking when we call on it are unsolved puzzles of our mental functioning.
- Experts disagree about what is meant by thinking. And there is good reason to believe that we haven't even begun to understand this complex and frequently very sloppy process.

Given all these ambiguities, we would certainly have considerable difficulty in fixing on an unambiguous, universally acceptable definition of "good thinking." It would be still harder to develop a pencil-and-paper test that could adequately and unequivocally come up with a score for thinking. Yet we continue to try.

The Rankin-Hughes Framework of Thinking Skills suggests that "the major thinking processes have much in common." The framework identifies a generic process with seven steps or stages that a person goes through when he or she thinks. These include: 1) focusing, 2) gathering information, 3) organizing information, 4) analyzing information, 5) generating ideas, 6) synthesizing, and 7) evaluating and applying.[6]

In Stephen Norris and Robert Ennis' *Evaluating Critical Thinking*, we find the following 15 guidelines for writing multiple-choice items for tests of critical thinking:

> 1. Construct each item with one and only one correct or best answer.
> 2. Avoid "none of the above" and "all of the above" as choices when examinees are to choose the best, rather than [the] precisely correct answer.
> 3. Use either a direct question or an incomplete statement as the item stem.
> 4. Write items in clear and simple language.
> 5. State the central problem of the item clearly and completely in the stem.
> 6. Include most of the reading in the stem.
> 7. Base each item on a single, central problem.
> 8. Construct options in homogeneous grammatical form.
> 9. Include in the stem any words that would otherwise need repeating in each option.
> 10. Emphasize negative words or words of exclusion and avoid such words where possible.
> 11. Place options at the end of the item stem, not in the middle of it.
> 12. Arrange the options in logical order, if one exists.
> 13. Avoid unintended hints based on: grammatical consistency or inconsistency between stem and options; repetition of key words in the stem and keyed option; rote or other verbal associations between key words in the stem and the keyed option.
> 14. Avoid hints based on the: unusual length of the keyed option; degree of qualification stated in the keyed option, or use of terms such as "never" and "always" in the unkeyed options; lack of independence and mutual exclusivity of the options; frequency with which the keyed option is placed in a given option position; pattern of the location of the keyed position.
> 15. Avoid hints from one item to another.[7]

The assumption is implicit: if we follow these simple guidelines, we ought to be able to come up with a "good" teacher-made test to assess pupils' thinking.

Connie Missimer's Test of Critical Thinking Skills requires that we identify the conclusions, reasons, and issues in a collection of items. For example:

> Driving while low on gas is a bad idea. First, dirt particles at the bottom of the gas tank will be pushed into the motor with the remaining gas. Second, there is danger of running out of gas, either because the gas gauge is inaccurate or because the driver forgets to fill up the tank.
>
> 1. The conclusion of the argument is:
>   a. dirt particles at the bottom of the gas tank will be pushed into the motor
>   b. there is danger of running out of gas
>   c. driving while low on gas is a bad idea
>   d. the driver forgets to fill up the tank
>
> 2. A reason offered to support the conclusion is that
>   a. there is a danger of running out of gas
>   b. many drivers are careless
>   c. driving while low on gas is a bad idea
>   d. gas costs less now than it did in the recent past
>
> 3. The issue being argued is
>   a. whether driving while low on gas is a bad idea and if so, why
>   b. whether drivers are careless and if so, why
>   c. whether gas costs less than it did in the recent past and if so, why
>   d. whether dirt particles get pushed into the motor and if so, why[8]

Robert Sternberg offers an approach to measuring thinking skills that models the mental processes that children use in solving problems. Higher marks go to pupils who are skillful in drawing inferences such as those in the example below.

> This item type requires students to recognize false assumptions or persuasive techniques used in advertisements of the kind frequently heard on TV or read in magazines and newspapers:
>
> The Avon Supermarket advertises "low, low prices." Can you be sure that the prices at the Avon Supermarket are the lowest prices in town?
>   a. Yes, because otherwise the supermarket could not advertise "low, low prices."
>   b. Yes, because the prices are lower than low.
>   c. No, because the advertisement is not truthful.
>   d. No, because there is no indication that the prices are the lowest in town.[9]

Sternberg also awards higher marks to students who are able to "learn from context":

> In the following passage, what does glick mean?
>
> Traffic was heavy, and so the glick moved slowly. The driver was carrying almost a ton of fruit from Florida to New Jersey and wanted to make sure that his shipment arrived intact. Thus, he made sure he stopped at red lights and avoided passing cars.
>   a. truck
>   b. car
>   c. orange
>   d. train[10]

ENGLISH 101
TOMORROW'S ASSIGNMENT:
WRITE A PAPER SHOWING HOW CLICHÉS HAVE BEEN A THORN IN THE SIDE OF WRITERS SINCE TIME IMMEMORIAL.
SCHWADRON

He would also award higher marks to se who are able to use insight to solve athematical and logical problems. For example:

> I have five black socks and four blue socks in a drawer. How many socks do I have to take out of the drawer to make sure I have a pair of the same color?
> a. 2
> b. 3
> c. 4
> d. 5[11]

In the last example, perhaps a more interesting exercise would be to examine the assumptions one must make before arriving at the "correct" answer to this problem. (The correct answer is b.)

Even a cursory glance at the frameworks that offer definitions of thinking and at the test items that flow from explicit or implicit definitions of critical thinking will reveal that these authors believe with certainty: *this* is thinking. They have made the assumption that the process is clear. If we perform these functions well, we will be counted among the good thinkers. If we perform them poorly, we will be numbered among the poor thinkers. Now that we understand what think- g is, so *their* thinking runs, we can at ast measure it with certainty.

IN THE FACE of such certainty, my mind wanders off to contemplate Mozart. Was Mozart *thinking* when he composed his *Jupiter* Symphony? If so, was he following the Rankin-Hughes framework? Not very likely, you say.

What if he had been admonished by his teacher that this was, in fact, the "correct" way to think? That *thinking* must proceed through seven steps: focusing, gathering information, organizing information, analyzing information, generating ideas, synthesizing, and evaluating and applying? I have the terrible, gnawing suspicion that not only would this framework *not* work for Mozart, but it would probably not work for the other creative geniuses whose works we so admire: writers such as Shakespeare, Joyce, or T.S. Eliot; artists such as Giacometti, Van Gogh, Chagall, or Beethoven; and scientists such as Einstein, da Vinci, Buckminster Fuller, or Richard Feynman, to name but a few from each tegory.

What's more, my suspicion grows that, for all its earnest endeavor, such a framework might be a destroyer of creative genius. Once we have accepted any single framework of thinking as our single standard of measurement, we implicitly reject the thinking of those who do not perform according to that standard. Instead of Mozarts, we might produce a population of Salieris – competent and pedestrian, but without a trace of genius.

Decisions about whether or not we test, which test we use, and which definitions we accept as the criteria by which to measure *thinking* are, without doubt, embedded in our personal belief systems. Our beliefs influence what we do; they guide and inform our educational practices. If we believe that the art of thinking follows, for example, the Rankin-Hughes framework or that it is accurately demonstrated by the ability to figure out the sock problem, then we will be likely to embrace tests that assess such specific functions. If we believe that thinking is best seen in the ability to be logical, then it follows that tests of logical reasoning are sufficient to assess our thinking. (Our logic must, of course, be the same logic as that of the test makers.)

On the other hand, if we believe that thinking is a set of very complex, sophisticated, and interrelated functions; that some acts of thinking are logical and others highly intuitive; that creative thinking rarely follows an orderly pattern; that there are degrees of creative and problem-solving capability that are not constant; that there is variation of performance within individuals; and that, in spite of many seminal tomes written on the topic of thinking, much ambiguity remains with respect to "good thinking," we are likely to need much, much more work before we dare to enter the realm of measurement. And we ought to be very, very wary of those enthusiasts who would lead us to measurement before the debate has been settled. Our record in assessing similarly complex and ambiguous constructs is, to date, not a cause for celebration.

There are other caveats about choosing tests to measure thinking that should be of great concern to any school official who might consider using them. First, once a test is embraced as *the measure*, it inevitably torques the curriculum in its direction. So if we decide that thinking is the ability to apply logic to figure out the sock problem (although it might well be logically argued that if one used one's eyes to peer into the sock drawer, one could see at once which socks were black and which were blue and would need to take out only two black socks or two blue ones), or to the run-out-of-gas problem, or to the ability to perform certain problem-solving functions in a given order, we might cease to prize intuitive, sloppy, generative acts from which the greatest creative breakthroughs occur. How, for instance, is a test that measures thinking according to one of these frameworks compatible with the way Lewis Thomas describes the functioning of a research scientist?

We ought to be very, very wary of enthusiasts who would lead us to measurement before the debate has been settled.

> In real life, research is dependent on the human capacity for making predictions that are wrong, and on the even more human gift for bouncing back to try again. This is the way the work goes. The predictions, especially the really important ones that turn out, from time to time, to be correct, are pure guesses. Error is the mode.[12]

A second caveat about choosing tests concerns the notion of measuring the complex acts of thinking by a single, numerical score. Although saying "this child is a 3.4 thinker" may sound silly, it would help to remember that we do exactly this in the process of measuring those complex acts called reading comprehension. We have done so for so long that we have grown to believe that such scores are, in fact, truth.

Third, the tests that have been developed thus far are all forced-choice measures. Ultimately, this produces in students not the ability to raise questions, but the tendency to look for single, correct answers. Of course, one might question whether the ability to perform well on these tests actually reflects the ability to think in these ways, or merely the ability to discern the response required by the test maker. But who knows? Maybe that's an even greater thinking skill!

Fourth, in spite of our good intentions to the contrary, the tests will lead to the labeling and categorizing of students. "He's a great thinker" is likely to be said of the Salieris, "He's a sloppy thinker" of the Mozarts, "His thinking is a mess" of the James Joyces, "His thinking is slow; he hasn't produced a thing of value in 10 years" of the J. D. Salingers. Will we then have children grouped, as we do for reading, into thinking-capability groups: the Brain Trust, the Robots, the Air Heads? Perhaps we could even have a group called the Eccentrics? ("We can't do a thing with those students. They don't follow any of the rules for thinking. Sit down, Wolfgang!")

The time factor is still another variable that warrants thoughtful scrutiny. Will "slow thinkers" be penalized? Is there merit only in thinking fast? Given that the completion of a section of a test must be performed in a certain predetermined interval, to what extent does such time pressure militate against thoughtful reflection? I don't know about other thinkers, but my own "best" thinking rarely occurs under time pressure. What's more, it almost never occurs when beckoned. More often it sneaks up on me when I least expect it, like around 4 a.m., when I'd much rather be sleeping. Given a test with a time constraint, it's clear where I would wind up.

I HAVE MADE a lengthy and – I hope – compelling case for the application of thoughtful consideration in choosing to test children's thinking. But I am *not* suggesting that we not try to learn about how students think and about how well they perform certain tasks that require thinking. This, for me, is an altogether different matter.

One of the most valuable yet rarely acknowledged assessment tools in educational practice is the sustained, thoughtful, day-to-day observation of student behavior by a competent, professional teacher. Good teachers use their eyes, their ears, virtually all their intuitive and professional senses to discern from a student's behavior how that student performs at certain classroom tasks. A competent teacher will *know* which student has the greater musical talent, who is the gifted artist, who is the poet of stunning imagery. That teacher will know which children are the good problem solvers and which have consistently "good ideas." A good teacher observes all the students perform, in many contexts, and gathers a vast body of data about the quality of individual performance over time. A good teacher does not judge a student's work by any single criterion; the judgments are based on many observations. Sometimes when a student receives a low score on a spelling test, the teacher *knows* that, because the student wasn't feeling well, the mark is not representative of her ability. The teacher *knows*. Data gathered from countless observations tell much more than any single score.

The teacher also *knows* which children are so impaired in their ability to cope intelligently that they manifest dependent behaviors in the extreme. The teacher *knows* which children are close-minded and exceedingly dogmatic in their views, which lack confidence in putting forth their ideas, which are unable to extract meanings from experience. A good teacher *knows* which students are having difficulty thinking for themselves.

If we could help teachers to become more skillful in making such observations, if we could train teachers to use observational skills with greater thoughtfulness, perspicacity, and wisdom, we would be able to draw on a considerable body of data about student thinking. Implicit in all of this is the notion that such teachers provide curriculum experiences that call for students to think beyond the level of merely regurgitating information, that teachers know the difference between lower-order and higher-order tasks, that teachers provide students with opportunities to work in ways that allow for the observation of a variety of behaviors. Of course, that is exactly what good teachers know and do. Instead of requiring a budding Mozart to take a written test on socks in the drawer, we could rather listen to the music he had produced. I realize that, for educators, this is a radical idea.

Ee Ff Gg Hh Ii Jj Kk Ll Mm Nn Oo Pp Qq
1×1=1

"Yes, it is mind-boggling."

But, say the naysayers, these are "soft" or "high-inference" measures, subject to a variety of interpretations. What's more, teachers are insufficiently skilled in making such assessments. Well, if that be true, I say help the teachers to become more skilled, rather than attempt to make the assessments teacher-proof. The megabucks that are going to be expended for tests could be channeled into retraining teachers and into higher salaries aimed at attracting a "higher level" of professional.

When push comes to shove in evaluation, I, as an informed professional, would far rather hear from a good teacher that my child's behavior is independent; that he does not depend on the teacher for help with every step of every problem; that he is able to make reasonable, thoughtful choices and to accept the consequences of these decisions; that he is a responsible and cooperative participant in a group; that he works purposefully and productively in the group; that he has self-confidence as a problem solver; that he exhibits self-initiating behavior; that he is able to make thoughtful, accurate observations; that he is able to suggest reasonable and appropriate hypotheses; that he is able to identify assumptions and differentiate assumptions from facts; that he is able to distinguish similarities and differences of significance when making comparisons; that he is able to classify objects and create classification categories; that he is able to gather data and make meaningful interpretations of them; that he is able to make sound decisions; that he is able to be creative, imaginative, and inventive in working on tasks; that he is able to design projects and experiments to test hypotheses; that he is able to suspend judgment and is more tolerant of uncertainty; that he is able to formulate and raise intelligent questions about phenomena; that he shows the ability to understand the "large" concepts of the curriculum; that he shows delight in exploration, experimentation, and discovery; that he shows a love for learning; that he shows increased interest in finding out and a decreased need to "know" the answer.[13] I would far rather know about all these behaviors than I would about the score he made on a test.

One way of helping teachers to sharpen their skills in classroom observation with respect to students' work on thinking tasks is through systematic, focused classroom observations of student behavior. For those who accept the premise that the way a person thinks is best demonstrated in his or her behavior,[14] the use of behavioral profiles that describe students' inability to function thoughtfully in a spectrum of day-to-day classroom situations can provide valuable data.

The behavioral profiles developed by Louis Raths were based on thousands of teachers' observations of student performance on thinking tasks.[15] For example, teachers observed that certain students behaved impulsively and "without thinking" and that they did so consistently. Teachers observed students who behaved "with great dependency," who "needed help almost all the time." Teachers observed students who "couldn't concentrate," who "couldn't connect means with ends," who "couldn't tolerate dissonance or openness," who "were in a rut and fearful of new ideas and new procedures." When teachers saw such behaviors, they invariably said, "That student is having difficulty with thinking."

I believe that good teachers observe these things and that they know about thinking and behavior, just as they know that Billy is having difficulty with his consonant blends. A good teacher doesn't need a test to figure this out. She sees it and hears it; she knows that it is not a single-occasion error but a persistent dysfunction. When she makes that observation, it enables her to do the kind of teaching that specifically addresses the student's need. Diagnosis and teaching are warp and woof of the same fabric. The teacher operates as a reflective practitioner.[16] The behavioral profiles also provide a means of recording gains that students make. They do not, however, allow us to score the "good thinkers."

Classroom observations and behavioral assessments are not perfect, but they do have important merits that make them worth our thoughtful consideration:

- They increase our options with respect to assessment. Instead of a single standard for all students, we can observe different kinds of thinking in different situations. Observations allow us to examine student performance in many contexts and over long periods. They provide a long-range view of many indicators of performance and behavior. If we are uncertain about a "reading," we have the option of continuing to gather data.
- They conjoin the acts of diagnosis and teaching. When we have gathered data about deficits in student performance that make sense to us, we are able to construct remedial interventions appropriate to students' need.
- Artfully done, observations – in virtually all professions (medicine, law, architecture, engineering, etc.) – yield the most valuable data.[17]

I REALIZE that what I am proposing here runs counter to the "scientific tradition" in education. We are enthralled by the idea that we can, to a 10th of a degree, determine how successfully a student reads, how successfully she thinks. It sounds so . . . hmm . . . scientifically accurate. Numbers have untold fascination for us: we seem to feel secure in knowing that we weigh 152 pounds; that our house is 2,500 square feet; that our blood pressure is 135 over 80; that the correlation is .92; that a test of significance is beyond the .01 level.

Yet, if we are prepared to face facts, measures are only numbers, and by themselves numbers have no intrinsic value. A human intelligence is required to *make meaning* from the numbers, and we have consistently failed to do that. So seductive has been our love affair with the numbers themselves that we have lost the art of dealing with the question of most substance: What does this number mean? For example, 152 pounds doesn't even begin to tell the story. What does the weight mean for the overall health of the person? *That* is the question of significance. The important issue is not a child's score in reading, but what that score actually means to what he reads, how he perceives reading, and how he is able to extract meaning from the written word. And these are questions we have hardly taken the trouble to ask.

Late at night, listening to Mozart's *Jupiter* Symphony, I worry a lot about thinking, especially since the "movement" to teach thinking seems to be fading from the educational horizon, giving way to newer, fresher concerns. I worry about our new enthusiasms for measuring thinking, our search for easy-to-mark, forced-choice, pencil-and-paper tests yielding single, numerical scores that "tell all." I worry that, in the measures we choose, we might trivialize our most wonderful human capability by measuring simply one process and judging all students by that single standard.

I worry, too, about whether we are ever going to be able to accept the notion that there are some very important activities that humans do that are so complex that we must live with their ambiguities. Measuring such things simplistically trivializes them, reduces them to the lowest level of absurdity. I worry that our earnest efforts on behalf of HOTS may give us the kind of music we all deserve: terminal Salieri.

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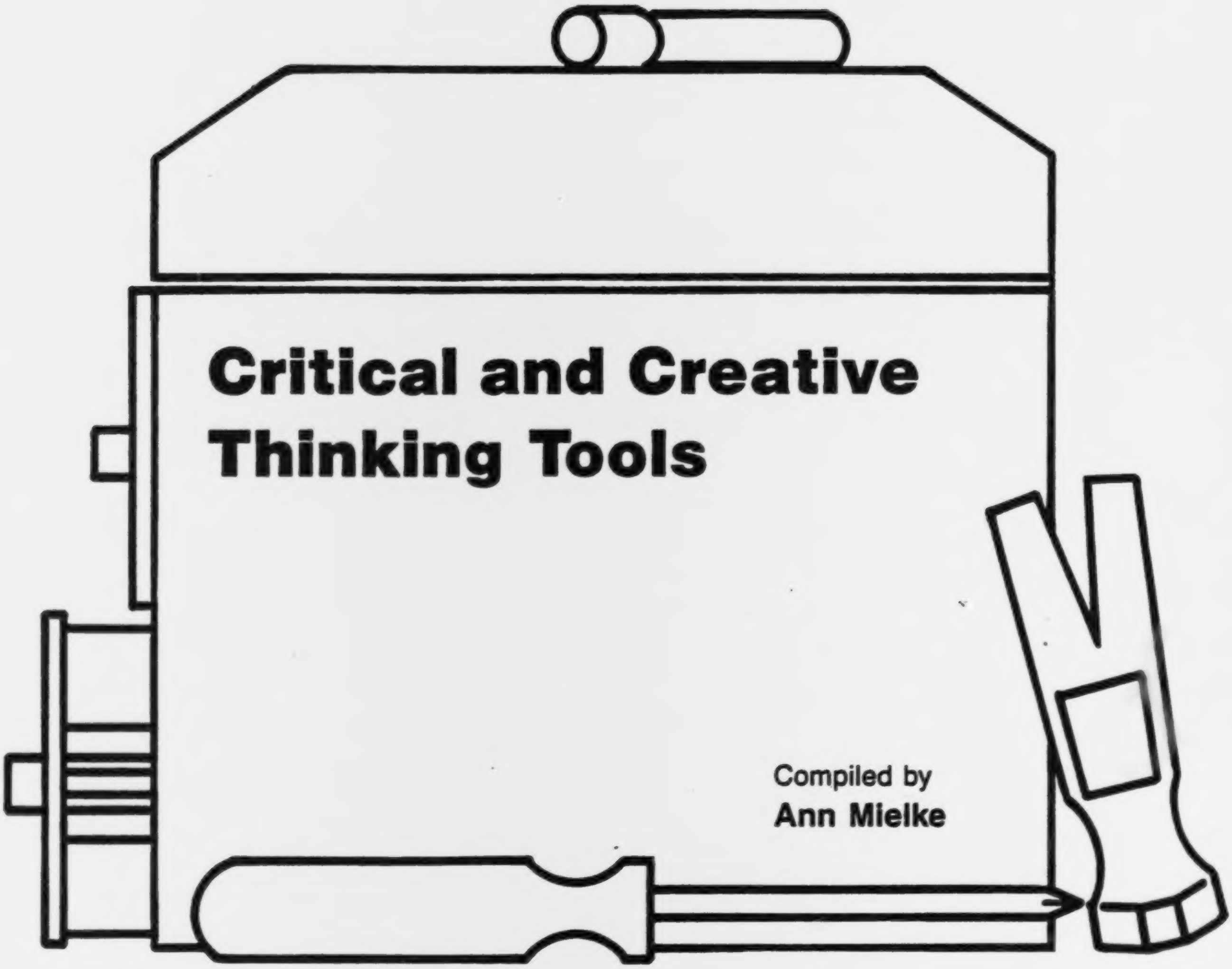

Critical and Creative Thinking Tools

Compiled by
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CRITICAL AND CREATIVE THINKING TOOLS

Thinking Tools are techniques or methods anyone can use to promote and build critical and creative thinking behaviors and attitudes. As you learn and practice these tools, you will be able to enhance your ability to think, solve problems, and make decisions efficiently and effectively.

Thinking Tools included in this packet:

Catalog Technique

Attribute Listing

Adaptation Game

Checklist Technique

ABC Checklist

Brainstorming

PMI - Plus, Minus, Interesting

APC - Alternatives, Possibilities, Choices

CAF - Consider All Factors

COT - Consequences Over Time

Morphological Analysis

Mapping

Questioning

Synectics

Problem-Solving Model

TOOL: **CATALOG TECHNIQUE**

OBJECTIVES: Encourages flexible, fluent, original thinking in problem solving.

Creates forced relationships (looking at things in uncommon or unrelated ways).

Allows for far-out, creative, playful ideas which can lead to looking at the problem from unique perspectives that, in turn, can act as stepping stones to potential solutions.

Develops ability to make analogies with unrelated things.

MATERIALS: A large catalog (Penney's, Sears, etc.)

PROCESS:

1. Can be done individually or in a group.
2. Pose or identify a problem.
3. Open the catalog to any page (random selection) and offer a solution to the problem by using the item(s) on the page.

PROBLEM 1: You have accidentally dropped your house key into a drain sewer along a city street. It is just beyond your reach. How could you get it out using the materials on your catalog page.?

PROBLEM 2: How is your job like something on your catalog page?

PROBLEM 3: You have a student who does not understand ___________________ (write in a concept you teach). Help him/her understand that concept by creating an analogy with something from your catalog page. Then, have the student turn to another page in the catalog and create his/her own analogy.

HOW CAN I USE THE CATALOG TECHNIQUE?

TOOL: **ADAPTATION GAME**

NOTE: This technique works well after using attribute listing.

OBJECTIVES: Encourages flexibility, fluency, and originality in thinking.

Develops the ability to look at things in uncommon or unrelated ways.

Builds brainstorming capability.

MATERIALS: Anything. (Pencil, cup, coffee filter, brick, wrench, pipe, etc.)

PROCESS:

1. Can be done individually or in a group.
2. Pick an object and try to list as many uses for that object other that its intended use.
3. Once you have looked at the item in its original form, consider these changes and list your ideas:
   a. The item is ten times smaller.
   b. It is ten times larger.
   c. You have 2 million of them.
   d. It is made out of a different material: concrete, plastic, acrylic, copper, iron, gold, etc.

PROBLEM 1: Consider a floppy disk.

PROBLEM 2: Consider a ping pong ball.

PROBLEM 3: Consider a ____________________ (fill in something used in or part of your program.)

HOW CAN I USE THIS TECHNIQUE?

TOOL: **ATTRIBUTE LISTING** (from Robert Crawford)

OBJECTIVES: Generates descriptions of the qualities of an item.

Offers suggestions for improvement, change, and identification of quality standards.

Encourages exploration, description, and flexibility.

MATERIALS: Any item, person, situation.

PROCESS:

1. Choose an item, person, situation.
2. Can be done individually or in a group.
3. List the attributes of the topic.
4. Some categories to consider for attributes:
    - a. color
    - b. texture
    - c. shape
    - d. composition
    - e. size
    - f. power or speed
    - g. number
    - h. length
    - i. width
    - j. qualities
    - k. values
    - l. behaviors
    - m. activity
    - n. result
5. Change or add attributes depending upon the topic or area you are dealing with.
6. Attribute listing can be used to suggest ways to improve products, people, and/or situations. Ask the question: How would I like to improve this product, myself, this situation? Then list the attributes as they already exist. Next add the attributes you like to see added.

PROBLEM 1: List the attributes of a thumbtack.

PROBLEM 2: List the attributes of an adult student.

PROBLEM 3: List the attributes of ____________________
(Choose something from your job or program)

HOW CAN I USE THIS TECHNIQUE?

TOOL: **CHECKLIST TECHNIQUE** (from Alex Osborn)

OBJECTIVES: Encourages fluent and flexible thinking by arranging things on a list.

Allows for the establishment of evaluation standards.

Suggests questions to consider when trapped by blocks.

MATERIALS: Any item, person, situation.

PROCESS:

1. Can be done individually or in a group.
2. Choose an item, person, situation.
3. Prepare a list of requirements, limitations, attributes, qualities, etc.
4. Use the list to evaluate related items or check for more ideas.

PROBLEM 1: Create a checklist for evaluating a teacher.

PROBLEM 2: Create a checklist for evaluating a manager.

PROBLEM 3: Create a checklist for evaluating ____________________ (an assignment you give, a curriculum project, etc.).

HOW CAN I USE THIS TECHNIQUE?

CHECKLIST FOR NEW IDEAS

by Alex Osborn from Applied Imagination

Put to other uses?

* New ways to use as is?
* Other uses if modified?

Adapt?

* What else is like this?
* What other idea does this suggest?
* Does past offer a parallel?
* What could I copy?
* Whom could I emulate?

Modify?

* Change meaning, color, motion, sound, odor, form, shape?
* New Twist?
* Other changes?

Magnify?

* What to add?
* Greater frequency?
* Higher?
* Thicker?
* Plus ingredient?
* Multiply?
* More time?
* Stronger?
* Longer?
* Extra value?
* Duplicate?
* Exaggerate?

Minify?

* What to subtract?
* Condense?
* Lower?
* Lighter?
* Streamline?
* Understate?
* Smaller?
* Miniature?
* Shorter?
* Omit?
* Split up?

Substitute?

* Who else instead?
* Other ingredient?
* Other process?
* Other place?
* Other tone of voice?
* What else instead?
* Other material?
* Other power?
* Other approach?

Rearrange?

* Interchange components?
* Other layout?
* Change pace?
* Change schedule?
* Other pattern?
* Other sequence?
* Transpose cause and effect?

Reverse?

- * Transpose positive and negative?
- * How about opposites?
- * Turn it upside down?
- * Change shoes?
- * Turn other cheek?
- * Turn it backward?
- * Reverse roles?
- * Turn tables?

Combine?

- * How about a blend, an alloy, an assortment, an ensemble?
- * Combine units?
- * Combine appeals?
- * Combine purposes?
- * Combine ideas?

"Manipulative" Verbs

by Don Koberg and Jim Bagnall in *The Universal Traveler*

Multiply
Divide
Eliminate
Subdue
Invert
Separate
Transpose
Unify
Distort
Rotate
Flatten
Squeeze
Complement
Submerge
Freeze
Soften
Fluff-up
By-pass
Add
Subtract
Lighten
Repeat
Thicken
Stretch
Extrude
Repel
Protect
Segregate
Integrate
Symbolize
Abstract
Dissect

TOOL: **ABC CHECKLIST**

OBJECTIVES: Encourages fluent, flexible thinking by identifying qualities within a limited framework.

MATERIALS: Any item, situation, person.

PROCESS:

1. Can be done individually or in a group.
2. List the attributes of your topic according to the ABC's. Identify one (or more) A attribute, a B attribute, a C attribute, etc.

3. Useful to get attention focused on a new topic or problem.

PROBLEM 1: Do an ABC Checklist by completing this statement: Baseball is ________________.

PROBLEM 2: Do an ABC Checklist by completing this statement: My job is __________________; or My program of study is __________________.

PROBLEM 3: Do an ABC Checklist by completing this statement: A critical and creative thinker is _____________________.

HOW CAN I USE THIS TOOL?

TOOL: **BRAINSTORMING**

OBJECTIVES: Stimulates production of ideas.

Encourages fluency and flexibility.

Promotes original thinking by suspending judgment.

MATERIALS: Topic.
Pen and paper or recorder.

PROCESS:

1. Can be done individually or in a small group.

2. Follow the Rules for Brainstorming:
    * **Do not evaluate, judge, or criticize ideas during the brainstorming session.**
    * **Work for quantity of ideas.**
    * **Expand on each other's ideas. Be fluent: improve, combine, improvise.**
    * **Encourage far-out ideas. Be flexible.**
    * **Record each idea.**
    * **Set a time limit.**

3. When the brainstorming session is over, have group members clarify any statements on the list that are not clear.

4. Evaluate ideas after the session ends. Three ways to evaluate the ideas are:
    a. Classify the ideas according to the following scale:
        (1) directly useful
        (2) interesting and possibly useful
        (3) for further examination or research
        (4) discard
    b. Brainstorm criteria or boundaries you will need to consider for decisions or implementation of solutions to your problem. Create a checklist to use with potential solutions.
    c. Have the group members prioritize their top choices (top three, four, five.... choices). Record the top choices, and discuss or deal with those in detail.

5. To make brainstorming effective:
    a. Do warm-up brainstorming to begin with....something just for fun. See the suggested list of topics if you can not think of any to do.
    b. Pose problems to your group that you

intend to act on. This means that you have to carefully define the problems and establish limits or boundaries if there are some. Do not ask group members to brainstorm for ideas and then reject their efforts. This is discouraging because it wastes time, creates distrust, and decreases morale. If you want your group members to feel as if they are part of a problem-solving team, act on their ideas. Don't tell them you want their input and then discard their contributions.

PROBLEM 1: Brainstorm gripes you have about students, teachers, managers, or employees.

PROBLEM 2: Brainstorm a list of characteristics, behaviors, and attitudes that describe the "ideal" student, teacher, manager, or employee.

PROBLEM 3: Brainstorm things a you could do to discourage things on the gripe list and encourage the characteristics and behaviors on the "ideal" list.

HOW CAN I USE THIS TOOL?

BRAINSTORMING SUGGESTIONS

1. Ways old magazines could be put to use.
2. Ways to encourage more people to go onto school after high school graduation.
3. Ways to use envelopes which have been opened with a letter opener.
4. Ways a teacher could make the average classroom a more pleasant and efficient place to work.
5. Ways to save money.
6. Ways a milk container could be use when it is empty.
7. How to have a good party without alcohol.
8. Ways to earn extra money.
9. Things to do for fun that cost under $5.00.
10. Ideas for brainstorming.
11. Things which operate in the principle of the simple lever.
12. Names for a new pet.
13. Names for a baseball, football, basketball, hockey, or soccer team.
14. Ways to improve a bicycle, a car, a boat, etc.
15. Ways to use an empty tin can.
16. Things that are round, square, triangular, or any other specified shape.
17. Ways to introduce a new breakfast food to the public.
18. Things to eat for breakfast that are different from the usual breakfast foods.
19. Inventions the world could use which have not been invented yet.
20. Uses for a belt.
21. Ways to improve fast food.
22. Uses for a wooden pencil.

23. Ideas for children's toys that promote peace.

24. Ways to prevent people from cutting across your lawn.

25. Ways to get to sleep when you are having a hard time falling asleep.

26. Ways to handle juvenile defenders other than imprisoning them.

27. Topics of conversation you could use with someone you just met.

28. Questions you could be asked at a job interview.

29. Things you could do to improve your grades at school or your performance at work.

30. Ideas to prevent drunk driving.

31. Things a family could to together without leaving home or watching television.

32. Gadgets that make life easier.

33. Ways to persuade someone to hire you.

34. Things managers, bosses, supervisors could do to show they appreciate your hard work.

35. Ways to show managers, bosses, supervisors that you are a hard worker.

36. Things a community could develop or do for teenagers that would be fun, and keep them from illegal activities such as vandalism, drinking, or drug use.

37. Ideas to prevent drunk driving.

38. Things a community could develop to assist the elderly.

39. Ways to get the elderly and young people together.

40. Ways to improve efficiency on the job.

41. Things to do to make work easier or more enjoyable.

42. Things to do with a group or four-year-olds (or any specific age) on a rainy day.

43. Things an individual could do to help the poor.

44. Ways we could improve our local, state, or federal

government.

45. Things you can do to improve your home life.

46. Ways to get more people to vote in local, state, and national elections.

47. Things to do when you (or your children) are bored that are not illegal, dangerous, or costly.

48. Ways to improve your school.

49. Things to do to increase literacy.

50. Things you could do to make this world a better place.

51. Questions you could ask in a class about the topic you are studying.

52. Questions to ask that would be interesting to research or think about.

53. Things to do for a party (birthday, anniversary, Halloween, Christmas, Easter, etc.).

54. Things that bug you.

55. Things you wish would work better.

56. Ways to improve mass transit...buses, subways, planes, trains....

57. Ways to learn about people in different parts of the world.

58. What you hope to accomplish this year.

59. Values you would/do teach your children.

60. People you would like to have individual conversations with (living or dead).

61. Ways to improve attendance in school.

62. Ways to improve church attendance.

63. Things to do to cut down on employee absence.

64. Things you like about your family.

66. People you admire.

67. What you would do if you won a million dollar lottery.

68. Things to do to decrease teenage pregnancies.

69. Things to do to decrease drug and alcohol abuse.

70. Gifts to give for Christmas that you make or do.

71. Things to do to loose weight or stop smoking.

72. List of figures of speech that when visualized are humorous or interesting. ("Put your foot in your mouth," "Head in the clouds," "A frog in my throat," and so on.)

73. Come-backs for these situations:

    a. You've locked your car keys inside your car. A passerby sees you trying to figure out a way to get inside the car and says, "Locked you keys inside, uh?" You say....

    b. A police officer catches you going 50 in a 25 mph zone. She says, "Where's the fire?" You respond....

    c. You are eight months pregnant with twins. A casual acquaintance, you haven't seen in years says to you, "So you're pregnant!" You say....

    d. You are a teacher. A student who has missed the last three classes comes to you and says "I've missed class recently. Did we do anything important?" You reply....

    e. You and your spouse are expecting your second child. Your first child was a girl. Someone says to you "Well now, you must be hoping for a boy since you already have a girl." You say ....

TOOL: "PMI" - PLUS, MINUS, INTERESTING
(from Edward deBono)

OBJECTIVES: Focuses attention on the positive, negative, and interesting facets of a topic or problem.

Encourages exploration of ideas, subjects, situations, or problems.

Discourages value judgments.

Forces consideration of thoughts and ideas about situations one might accept without thought.

MATERIALS: Topic, situation, or problem.
Pen and paper.

PROCESS:

1. Can be done individually or in a group.
2. For a period of six to nine minutes, focus your attention on first the Plus points, then the Minus points, and finally the Interesting points. Allow equal time for Plus, Minus, and Interesting.
3. Use PMI especially when you have no doubt about a situation because you have instantly decided that you liked it or didn't like it. It is designed to force you to look at situations you may have accepted without thought.

PROBLEM 1: Do a PMI: High school students should be paid twenty dollars a week for perfect attendance at school.

PROBLEM 2: Do a PMI: At elections, everyone should have two votes; one of these can be used negatively to cancel a vote for a disliked candidate.

PROBLEM 3: Do a PMI: Managers and administrators would be elected for their positions by subordinates instead of hired.

PROBLEM 4: You lost your job tomorrow.

PROBLEM 5: The budget for your department would be decreased by 30%.

HOW CAN I USE THIS TOOL?

TOOL: **"APC" - ALTERNATIVES, POSSIBILITIES, CHOICES** (from Edward deBono)

OBJECTIVES: Generates as many alternatives as possible for the topic under consideration.

Encourages flexibility, fluency, elaboration, and originality.

MATERIALS: Topic, problem, situation.
Pen and paper.

PROCESS:

1. Can be done individually or in a group.
2. The words alternatives, possibilities, and choices are used interchangeably, depending on the wording of the topic under consideration. This technique is similar to brainstorming.
3. It is useful for:
   * Looking for alternative definitions of a problem.
   * Generating different approaches to solving a problem.
   * Searching for different solutions to a problem.
   * Identifying ways to evaluate the potential success of a solution.
   * Reviewing something which is currently not a problem. (This is useful to see if the process could be simplified, made more effective or more productive.)
   * Designing or creating something that is going to achieve some purpose.

PROBLEM 1: Do an APC: A young person is seen pouring cans of beer into the gas tank of her car at a gasoline station. What possible explanations might there be for this behavior?

PROBLEM 2: Do an APC: Early one morning a man is seen burying three red socks in the garden, each sock in a separate hole. What alternative explanations could there be for this?

PROBLEM 3: Do an APC: An "A" student with excellent attendance does not show up for the last four weeks of your class and does not contact you about finishing the semester. What possible reasons for this might there be? What are your alternatives in dealing with this problem?

HOW CAN I USE THIS TOOL?

TOOL: **"CAF" - CONSIDER ALL FACTORS**
(from Edward deBono)

OBJECTIVES: Focuses attention on the factors to consider when solving a problem, making a decision, analyzing an issue, or evaluating an idea.

Attempts to make clear factors which would remain broad and general.

Encourages speculation as to the cause or effect of something.

MATERIALS: Topic or problem.
Pen and paper.

PROCESS:

1. Can be done individually or in groups.
2. Deliberately consider the factors that affect the decision to be made or the problem to be solved.
3. Ask "What has been left out?" and "What ought we consider as well?"

PROBLEM 1: CAF: Buying a used car.

PROBLEM 2: CAF: One in every four units of a company's products has to be returned because of poor quality.

PROBLEM 3: CAF: The issue of abortion.

PROBLEM 4: CAF: Looking for a job.

PROBLEM 5: CAF: Deciding to take a course.

PROBLEM 6: CAF: Adapting thinking tools into your job, the organizations you belong to, and/or your personal life.

HOW CAN I USE THIS TOOL?

TOOL: "COT" - CONSEQUENCES OVER TIME
(from Edward deBono, originally C & S)

OBJECTIVES: Forces consideration of the consequences of an action or decision over several time periods.

Clarifies potential problems or opportunities.

Encourages future oriented thinking.

MATERIALS: Topic or suggested solution to a problem.
Pen and paper

PROCESS:

1. Can be done individually or in a group.

2. Consider the consequences of a topic or proposed solution over four time periods:
   a. Immediate - 1 year
   b. Short-term - 1 to 5 years
   c. Medium-term - 5 to 20 years
   d. Long-term - over 20 years

3. The time frames are arbitrary...establish different ones as determined by the nature of the topic.

NOTE 1: This is a very difficult technique to use since we are not conditioned by our culture to think in terms of the distant future. We are also reluctant to assign specific time zones since we think of consequences in terms of generalities, such as "It might happen sometime."

NOTE 2: A very effective way to use this technique is to combine it with the PMI. For each time period consider the pluses, minuses, and interesting predictions.

PROBLEM 1: Power for electricity came exclusively from nuclear power.

PROBLEM 2: The education budget is doubled under the new presidential administration.

PROBLEM 3: Office work is done at home via computer terminals.

PROBLEM 4: Do a COT and a PMI on this topic: You lost your job today.

HOW CAN I USE THIS TOOL?

TOOL: **MORPHOLOGICAL ANALYSIS**

OBJECTIVES: Increases idea production through divergent thinking based on forced relationships.

Stimulates the search for possible relationships of ideas, things, situations.

Encourages looking at things from different perspectives.

MATERIALS: Topic or problem
Pen and paper

PROCESS:

1. Identify criteria or characteristics of the topic or problem.
2. Establish columns (parameters) for similar concepts. (Two columns of ten items each will yield 100 combinations of ideas.)
3. Number the items along the vertical from 1 to the number of items listed.
4. Choose or assign two numbers for two parameters; three for three parameters.)
5. In a discussion, activity or assignment, participants are to explain the relationship, design a new product or item, etc. using the items identified for them.

EXAMPLE 1: "Inventing New Products"

Instructions: Choose a number between 111 and 999. Find the word in each column that coincides with that number. For example, if I choose 476, my words would be: shoes, button, and safety. Using your combination of words, think up interesting, unique, creative products.

1. pencil
2. window
3. book
4. shoes
5. credit card
6. run
7. party
8. collar
9. knife

1. theater
2. ice cream
3. dog
4. egg
5. bicycle
6. key
7. button
8. vacation
9. jewelry

1. rubber
2. candy
3. blanket
4. television
5. cup
6. safety
7. magazine
8. computer
9. exercise

EXAMPLE 2: "Handling Juveniles in a Criminal Justice System"

Instructions: As a counselor in a juvenile home, you have to work with one of the young inmates. The person you have been assigned is #2431. (Male, age 13, black, bored, from a middle class family where the father has custody. The youth was found guilty of burglary.) How would you begin to deal with that person?

	PERSON	EMOTIONAL STATE	FAMILY	CRIME
1.	male, 15 white	angry	middle class two parents	burglary
2.	male, 13 black	withdrawn	lower class mother	car theft
3.	female, 16 white	defensive	working class two parents	dealing drugs
4.	female, 14 black	bored	middle class father	prostitution

EXAMPLE 3: "Social Problems and American Institutions"

Instructions: Based on the numbers you are assigned, analyze the relationship of the concepts identified for you.

	SOCIAL PROBLEM	INSTITUTION	SOCIOLOGICAL CONCEPT
1.	population	family	urban environment
2.	drugs	religion	culture
3.	nuclear weapons	education	socialization process
4.	AIDS	economy	bureaucracy
5.	mental illness	government	primary group
6.	organized crime	science	prejudice

PROBLEM: Create a morphological analysis by creating three parameters, each containing 5 items. The three columns should be (a) competencies or objectives of your course; (b) classroom activities/teaching methods; (c) critical and creative thinking behaviors/attitudes you would like to promote more of in your classroom.

	COMPETENCIES	METHODS	CCT BEHAVIORS AND ATTITUDES
1.			
2.			
3.			
4.			
5.			

HOW CAN I USE THIS TECHNIQUE?

TOOL: **MAPPING**

OBJECTIVES: Organizes information in a spatial and flexible format.

Allows for the addition or deletion of ideas as the need arises.

MATERIALS: Topic
Pen and paper

PROCESS:

1. Can be done individually or in a group.
2. Write the topic on the paper anyplace you wish.
3. Consider the factors involved in the topic and add major and minor arteries germinating from the topic. The major and minor arteries act as the categories of an outline.
4. This is also called the web technique because the finished product often resembles a spider web.
5. You can add drawings or designs to the map that symbolize or reflect your ideas.
6. Different color pens or markers for the categories add a creative touch as well as highlight the organization of the map.
7. Mapping is a useful tool for: organizing your notes, planning a project, giving a test, planning a presentation, organizing your thinking about anything.

PROBLEM 1: Do a map of who you are. Include things like qualities, characteristics, activities, roles, experiences, and so on.

PROBLEM 2: Map the major ideas in a current chapter or area of study in a course you are taking.

PROBLEM 3: Map your goals. Categories could be based on time periods or types of goals.

PROBLEM 4: Map your job or a course you teach/are taking.

HOW CAN I USE MAPPING?

TOOL: **QUESTIONING**

OBJECTIVES: Encourages thoughtful consideration of ideas, information, issues, and factors involved in problems.

Provides for careful and complete analysis.

Leads to divergent and convergent thinking.

MATERIALS: Topic, problem, issue, situation.
Pen and paper (optional).

PROCESS:

1. Questioning can be done anytime, under any situation, for any reason.
2. You can improve your ability to use questions by examining "The Relationship Between Questioning and Thinking" which explains six levels of questions: knowledge, comprehension, application, analysis, synthesis, and evaluation, and the "Divergent Questioning Model" following this page.
3. When problems do not require specific answers, use divergent questioning to stimulate a wide fluency, flexibility, originality and elaboration.

PROBLEM 1: Your ten-year old daughter brought a note home from school explaining that her class will participate in a TV-Turn-Off for the month of December. What questions could you ask about this situaiton?

PROBLEM 2: At the high school Parent-Teacher's meeting the principal announced that he received a petition signed by fifty parents in the district asking that the Scarlett Letter be removed the American Literature curriculum. What questions would you ask about this situation?

PROBLEM 3: At a city council meeting, the manager of the city water system has reported that the primary clarifier, which was installed in 1968, is malfunctioning. She recommends that it be replaced within the next three months before serious problems occur. What questions would you ask about this situation?

HOW CAN I IMPROVE MY ABILITY TO USE QUESTIONS?

DIVERGENT QUESTIONING MODELS

1. Quantity Questions

(Encourages fluency, similar to brainstorming)

a. How many ways can you use a ________________?
b. List as many __________________ as you can.
c. What are all the possible solutions you can think of for ____________________?

2. Forced Associations

(Uses analogical thinking...making comparisons between different things.)

a. How is a __________________ like a _______________?
b. Get ideas from __________________ to improve ___________________.
c. I only know about ____________________. Explain it to me.

3. Involvement Questions

(Encourages the use of forced relationships to create comparisons between personal feelings and other objects or situations.)

a. How would _______________ feel if it were human and had feelings?
b. How would you feel if you were __________________?
c. If you were __________________ what would you see, taste, smell, feel?
d. You are a ___________________. Describe how it feels.

4. Reorganization Questions

(Uses the imagination to consider consequences of things by pretending they are true.)

a. What would happen if ____________________ were true?
b. Suppose ______________________ happened, what would be the consequences?
c. What would happen if there were no ________________?

5. Viewpoint Questions

(Encourages flexibility and seeing things from a different point of view.)

a. How would this look to a ____________________?
b. How would a ____________________ look from the viewpoint of a ____________________?
c. How would ____________________ view this?

6. Supposition Questions

(Fosters value clarification and exploration of beliefs.)

a. Suppose you could have anything you wanted. What ideas could you produce if this were true?
b. You can have all of the ____________________ in the world. How could you use it to ____________________?
c. You have been given the power to ____________________. How will you use it?

THE RELATIONSHIP BETWEEN QUESTIONING AND THINKING

Questions operate at six different levels of thinking. Each level requires higher or more sophisticated use of information, facts, concepts, or processes. It is important to understand how to effectively use questioning to solve problems, acquire the information you need or desire, and examine things, ideas, opinions, and situations. You also need to be aware of what is being asked of you when others ask questions.

Level 1: **KNOWLEDGE QUESTIONS**
PURPOSE: TO NAME FACTS, CONCEPTS, OR PROCESSES.

Knowledge questions, also known as concrete questions, require that you recall or locate facts, details, and definitions. Such questions involve the lowest level of thinking because they do not require you to make judgments, draw conclusions, apply information, compare or contrast the information, or put information together in different ways. These questions ask for what, where, when, and who information. Repeating and following directions, memorizing facts, and recording observations are skills at this level of thinking.

Sample questions:

How big is it?
How many are there?
What is the definition?
Where do I find it?
Who said it?
Where does this go?

Level 2: **COMPREHENSION QUESTIONS**
PURPOSE: TO UNDERSTAND FACTS, CONCEPTS, PROCESSES, OR SITUATIONS.

Comprehension questions ask for meaning. They ask you to explain, put into your own words, interpret, define, discuss, expand on, sense the organization or pattern of, and summarize information. Questions at this level require understanding of the facts, concepts, processes, or situations you are dealing with.

Sample questions:

What did he mean by what he said?
What does this word, expression, phrase, passage, or analogy mean?
Where does this fit?

Level 3: **APPLICATION QUESTIONS**
PURPOSE: TO USE FACTS, CONCEPTS, OR PROCESSES.

Application questions ask you to apply information. Similar words asking for application include select, solve, organize, make use of, operate, put into action, construct, put together, and demonstrate.

Sample questions:

Are you able to put this together?
Can I show how this works?
Can you use this equipment?

Level 4: **ANALYSIS QUESTIONS**
PURPOSE: TO TAKE APART FACTS, CONCEPTS, PROCESSES, OR SITUATIONS.

Analysis questions ask you to break information into pieces. This means you would categorize, group, dissect, analyze, classify, search, compare, contrast, differentiate, and simplify information.

Sample questions:
What are the causes and effects?
How is this alike and how is this different?
Where does this information fit?

Level 5: **SYNTHESIS QUESTIONS**
PURPOSE: TO PUT TOGETHER IN A NEW WAY.

Synthesis questions require you to apply information to another situation. This means that you are able to see further or potential use of the information. Words used in synthesis questions include create, design, develop, combine, construct, predict, invent, estimate, rearrange, hypothesize, and reorganize.

Sample questions:
How can I use this?
How does this fit in with what I already know?
What can I make out of this?
Where might this be useful?
What if I tried this?

Level 6: **EVALUATION QUESTIONS**
PURPOSE: TO DETERMINE THE VALUE OF FACTS, CONCEPTS, PROCESSES, OR SITUATIONS.

Evaluation questions ask you to value, judge, or accept or reject facts or ideas. This high level thinking skill includes distinguishing between information that is relevant and irrelevant, recognizing the difference between real and unreal, and fact and opinion, determining purpose, point of view, or possible bias, determining the authenticity of information, and using and establishing criteria to be used for evaluating information. Words used in evaluation questions include judge, evaluate, choose, justify, determine, conclude, recommend, defend, appraise, and assess.

Sample questions:
What do I think of this?
How does this fit in with what I already know?
Is this source credible?
How reliable is this information?
How can I justify my opinion.
What would I recommend for solving this problem?

TOOL: **SYNECTICS**
(from George Prince)

OBJECTIVES: Uses the concepts of forced relationships and analogy to clarify ideas and see things from different points of view.

Makes the familiar strange and the strange familiar.

Encourages the use of divergent or creative thinking skills of fluency, flexibility, originality, and elaboration.

Helps breakdown blocks to thinking.

MATERIALS: Topic or problem.
Pen and paper.

PROCESS:

1. Best when done in a group with a designated leader.
2. Clearly state the problem or ideas for consideration.
3. Make a direct analogy. How is the topic or problem like something else? Ask group members to share their analogies. Record them for all to see.
4. Have someone from the group, or by group consensus, choose one of the analogies.
5. Ask group members to put the initial problem or ideas aside and concentrate on the topic suggested by the analogy chosen in step 4. Group members should close their eyes and think about the new topic. They should visualize images related to that topic. The leader can lead them on this "excursion" by describing things for them to think about.
6. Have the group members share their thoughts from the excursion. What did they visualize? List the ideas.
7. Have someone from the group, or by group consensus, choose one of the ideas just presented.
8. Go back to the original problem or topic

and have the group members come up with analogies (called "force fit") between the new idea and the original problem or topic.

9. What new perspectives do the group members have about the topic or problem?

10. The steps in the synectics process are:
    a. Statement of the problem or topic.
    b. Direct analogy.
    d. Excursion.
    e. Force Fit.
    f. New perspective.

PROBLEM 1: Consider a grocery store. What complaints or gripes do you have about grocery stores? Make a list of those complaints. Then choose one and try the synectics process to come up with ways to deal with or solve the problem.

PROBLEM 2: The elderly do not hold a very high status in our society. Use the synectics process to get an understanding of what it means to be old in the United States.

PROBLEM 3: When families go to the beach, they often find that the parking lot is quite a distance away from the beach. This poses a problem especially if they have several things they would like to take with them to the beach for the day. These things include food for a picnic lunch, a cooler, towels, beach toys, blankets, lawn chairs, etc. The family usually has to make several trips from the car to the beach, and back again at the end of the day. Pretend you are inventors working for a company that makes convenience items for consumers. Use the synectics process to come up with solutions to this problem.

PROBLEM 4: Choose one of the gripes you have about students, teachers, managers, or employees from the list compiled for the brainstorming activity. State the gripe in terms of a problem. Use the synectics process to come up with suggestions for handling the problem or for ways to understand the problem from a different perspective.

HOW CAN I USE SYNECTICS?

A MODEL FOR PROBLEM-SOLVING OR DECISION-MAKING

I. **The Problem/Issue/Situation**

   A. State the problem in the form of a question.

   B. Consider the background of the problem.

      1. How did the problem develop?

      2. What factors contributed to the problem?

      3. What previous attempts were made to resolve the problem?

   C. Identify the factors involved in the problem. (CAF: Consider All Factors)

      1. What forces are present that could help solve the problem?

      2. What forces are present that may be preventing the problem from being solved?

      3. Who else is involved in the problem?
         a. Who must be involved in developing the solution?
         b. Who may be affected by the decision?
         c. How are you going to include them?
         d. Who must approve the solution?

      4. What beliefs and values are involved with this problem?
         a. Your beliefs and values?
         b. Other's beliefs and values?

      5. What limits or restrictions must you be aware of?
         a. Are the restrictions real or perceived as real?
         b. Are there ways to by-pass or minimize the restrictions?
         c. What time limits are you confined to?

   D. Re-define the problem if necessary.

II. The Process.

A. Determine what you need to know.

1. What information do you need to gather?

2. What sources of information can you use?
    - a. People?
    - b. Print material?

3. Where can you go to gather necessary information?

4. Are you excluding possible sources of information?
    - a. Based on your perceptions of possible sources?
    - b. Based on your beliefs and attitudes?

B. Gather and study the necessary information.

1. How are your and other's beliefs and values affected by the information?

2. Do you need to re-examine your beliefs in light of the information you have considered?

3. Do you need more information?

C. Consider options/alternatives/solutions.

1. What are possible options, alternatives or solutions to the problem?
    - a. List as many as you can. (Write them down.)
    - b. Use a thinking tool such as:
        - (1) brainstorming
        - (2) mapping
2. Do you have enough options to consider?

D. Evaluate each option.

1. What are the pros and cons, advantages and disadvantages, consequences of each alternative? (PMI)

2. What specific resources (money, material, support) and skills (know-how, abilities) will you need for each option?

3. What are the short and long-range implications for each option? (C&S)

4. How are your and other's beliefs and values affected by each option?

5. If others are involved, what are their opinions of each option?

6. How is each option affected by the restrictions or limits you are faced with?

III. The Decision/Recommendation/Solution.

A. Make a decision by choosing an option or combining options.

B. List your reasons for the preferred solution.

1. Is it practical and realistic enough to make a difference?

2. Is it's success or implementation probable?

3. Do your values and beliefs complement or support the solution or decision?

4. Does your recommendation fit within the limits or restrictions you identified?

5. What effects will your proposed solution have on yourself? others? society?

C. Consider the steps in implementing your decision.

1. What specific steps must you take to implement the decision?

2. In what order must you complete the steps?

3. How long will the implementation take?

4. Who must be involved with the implementation?
    a. Who must approve?
        (1) How is approval attained?
        (2) Is a time-line involved?
    b. What actions must others take to initiate, develop, and/or follow-up on the proposed solution?

5. What factors might hinder implementation and/or probability of success?
    a. People?
    b. Things?

        - c. Situations?

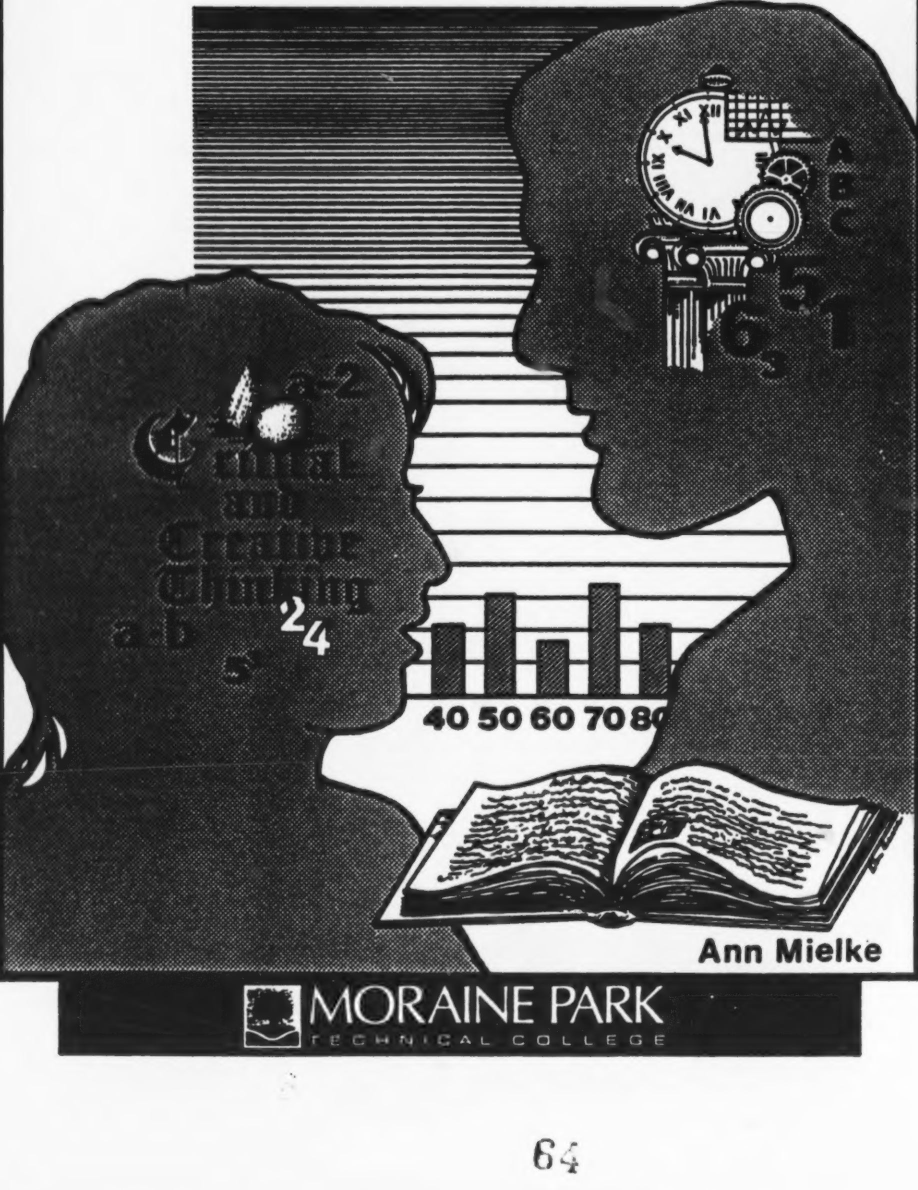
- D. Evaluate the proposed solution.
    - 1. How will the success or failure of the decision be evaluated?
        - a. By you?
        - b. By others?
    - 2. What criteria will you use to determine the success or failure of the solution?
    - 3. What time restraints are involved in the evaluation?

IV. Implement and Re-evaluate the Solution.

- A. Use the established criteria to evaluate the solution now in effect.
- B. Continue with the solution if it is working, or use the problem-solving model to deal with an ineffective solution.

809-161

Critical and Creative Thinking


a-2
Critical
and
Creative
Thinking
a-b
2
4
5
A
B
C
5
1
6
5
40 50 60 70 80

Ann Mielke

MORAINE PARK
TECHNICAL COLLEGE

MORAINE PARK TECHNICAL COLLEGE
Fond du Lac, Wisconsin

CRITICAL AND CREATIVE THINKING BEHAVIORS AND ATTITUDES SUMMARY

PERSEVERANCE. A critical and creative thinker does not give up when faced with frustration and difficulty. She attacks problems and decisions and stays with them until she finds a way to resolve them.

DECREASED IMPULSIVENESS. A critical and creative thinker looks closely and carefully at problems or situations. He tries to understand them before suggesting ways to deal with them. He pursues solutions systematically.

FLEXIBILITY. A critical and creative thinker considers alternate points of view or ways of dealing with problems and/or situations. She is able to offer many ways of looking at and solving problems and situations.

METACOGNITION. A critical and creative thinker is able to think about how he thinks. He is able to describe necessary steps to take to deal with a problem or make a decision. He is aware of others and his effects on others.

USE OF KNOWLEDGE. A critical and creative thinker is like a squirrel preparing for winter. She knows how to and when to search for more information. She is open to new information and ideas. She transfers knowledge from one area of expertise to new and challenging situations.

PROBLEM ORIENTATION. A critical and creative thinker is not only able to work at solving problems or making decisions, but is also able to recognize or pose problems and decisions for consideration. He is able to ask questions and search for more information as needed for the situation.

OPEN-MINDEDNESS. A critical and creative thinker is aware that her way is not the only way to look at or do things. She does not see the world in black and white, good and bad terms. She recognizes that there are many facets to consider in problems, opinions, issues and ideas.

USE OF QUALITY STANDARDS. A critical and creative thinker reflects on the accuracy and precision of his work and takes pride in his accomplishments. He is able to set forth personal standards of excellence as well as use objective standards for evaluation.

USE OF PRECISE LANGUAGE. A critical and creative thinker uses descriptive and precise words to clarify and elaborate her ideas and opinions. She gives enough information and speaks and writes in complete thoughts so that her audience can understand what she is trying to communicate.

AUTONOMY AND INDEPENDENCE. A critical and creative thinker tackles problems and does not avoid making decisions. He is self-motivated and curious, and he does not need direction from others to recognize what needs to be done. He is not afraid to think for himself.

Adapted from

Costa, Arthur L., "How Can We Recognize Improved Student Thinking?" *Developing Minds: A Resource Book for Teaching Thinking*. Association for Supervision and Curriculum Development, 1985: 288-290.

Costa, Arthur L. "The Behaviors of Intelligence." *Developing Minds: A Resource Book for Teaching Thinking*. Association for Supervision and Curriculum Development, 1985: 66-68.

MORAINE PARK TECHNICAL COLLEGE
Fond du Lac, Wisconsin

Compiled by Ann Mielke

CRITICAL AND CREATIVE THINKING BEHAVIORS AND ATTITUDES

PERSEVERANCE

A critical and creative thinker does not give up when faced with frustration and difficulty. She attacks problems and decisions and stays with them until she finds a way to resolve them.

Descriptions of perseverance:

- Tries to understand the points of view of others.
- Conscientiously and consistently attends to the requirements and responsibilities of her job, course work, family and/or other commitments.
- Does not give up when faced with frustration or difficulty.
- Strives to be precise and accurate.
- Stays on task. (As opposed to being easily distracted or looking for other things to do to avoid tackling the problem/task at hand.)
- Completes activities/assignments within reasonable or expected time frames.

DECREASED IMPULSIVENESS

A critical and creative thinker looks closely and carefully at problems or situations. He tries to understand them before suggesting ways to deal with them. He pursues solutions systematically.

Descriptions of Decreased Impulsiveness:

- Considers information, ideas and opinions carefully. (As opposed to being judgmental or argumentative.)
- Thinks before speaking or writing.
- Explores problems, topics, and situations systematically. (As opposed to repeatedly doing things by trial and error.)

- Makes sure directions are understood before beginning a task or assignment.

FLEXIBILITY

A critical and creative thinker considers alternate points of view or ways of dealing with problems and/or situations. She is able to offer many ways of looking at and solving problems and situations.

Descriptions of Flexibility:

- Uses various thinking strategies. (PMI, visualizing, brainstorming, etc.)
- Proposes several ways of dealing with and/or solving problems.
- Changes avenue of thought if and/or when reliable new evidence is presented.
- Considers variables when analyzing information.
- Recognizes and uses novel, creative images, solutions, relationships, and/or analogies.
- Creates unique and/or interesting ways of looking at or solving situations, problems and tasks.

METACOGNITION

A critical and creative thinker is able to think about how he thinks. He is able to describe necessary steps to take to deal with a problem or make a decision. He is aware of others and his effects on others.

Descriptions of Metacognition:

- Is aware of how and why she thinks the way she does about her and other's ideas, opinions, and situations.
- Plans, monitors, and evaluates his thinking before, during, and after problem-solving/decision-making.
- Is able to identify her use of critical and creative thinking behaviors and attitudes, and works on those she is weak in.
- Conscious of his behaviors and their effects on others.

- Uses environmental cues to determine appropriate behaviors in given situations. (Considers what is, and what is not appropriate given the time, place, and people involved.)
- Considers outcomes of her actions and/or decisions before implementing them.
- Is aware of how and when his emotions affect his thinking.

USE OF KNOWLEDGE

A critical and creative thinker is like a squirrel preparing for winter. She knows how to and when to search for more information. She is open to new information and ideas. She transfers knowledge from one area of expertise to new and challenging situations.

Descriptions of Use of Knowledge:

- Strives to broaden her knowledge both within and without her field. (Broadens mental field.)
- Looks for patterns/relationships in ideas, information, opinions and behaviors.
- Organizes information /ideas in a systematic way (through classifying, categorizing, charting, mapping, etc.) in order to make sense of it for self and others.
- Transfers knowledge and skills learned in one area or experience to other areas and experience.
- Refrains from using past experiences as the only factor when analyzing a situation, opinion, or idea.

PROBLEM ORIENTATION

A critical and creative thinker is not only able to work at solving problems or making decisions, but is also able to recognize or pose problems and decisions for consideration. He is able to ask questions and search for more information as needed for the situation.

Descriptions of Problem Orientation:

- Recognizes potential problems.
- Recognizes problems already in existence.
- Accurately defines and explains problems.

- Objectively analyzes problems as to their causes and effects.

- Recognizes discrepancies in problems, ideas, opinions, and situations. (A discrepancy is something that does not fit with something else. This also includes the ability to recognize fallacies in thinking.)

- Asks questions to clarify information, ideas, opinions.

- Asks abstract, critical, creative and hypothetical questions when exploring problems and ideas.

- Checks to see that ideas, opinions, and evidence are reliable and relevant.

- Recognizes need for, and searches for necessary and complete information.

- Determines significance of problems, situations and/or ideas. (Can tell how important a problem is.)

OPEN-MINDEDNESS

A critical and creative thinker is aware that her way is not the only way to look at or do things. She does not see the world in black and white, good and bad terms. She recognizes that there are many facets to consider in problems, opinions, issues and ideas.

Description of Open-Mindedness:

- Shows a willingness to doubt and/or examine his beliefs. (As opposed to believing his way of looking at or doing things is the only way.)

- Able to state arguments and/or evidence for opinions and ideas different from her own.

- Acknowledges other points of view as having validity.

- Recognizes and works to overcome mental blocks and mindsets.

- Avoids using absolutes (all, none, never, etc.)

- Puts his past experiences into perspective. (In other words he works to overcome episodic, egocentric, myopic view of reality.)

- Expresses another person's ideas, point of view, feelings accurately while conversing with them and when relaying information to others.

- Tolerates ambiguity while searching for clarity. (Ambiguity refers to things that can be understood in more than one way.)

USE OF QUALITY STANDARDS

A critical and creative thinker reflects on the accuracy and precision of his work and takes pride in his accomplishments. He is able to set forth personal standards of excellence as well as use objective standards for evaluation.

- Applies rules, models, and/or criteria when completing activities.

- Establishes criteria and/or uses prescribed criteria to evaluate her decisions, solutions to problems, and completed tasks.

- Strives for quality, craftsmanship, accuracy in work.

- Defends opinions and/or ideas objectively with logical and relevant evidence (As opposed to being irrational or emotional when expressing or defending ideas and opinions.)

USE OF PRECISE LANGUAGE

A critical and creative thinker uses descriptive and precise words to clarify and elaborate her ideas and opinions. She gives enough information and speaks and writes in complete thoughts so that her audience can understand what she is trying to communicate.

Descriptions of Use of Precise Language:

- Uses clear specific, concrete, descriptive language in speaking and writing.

- Uses the English language correctly.

- Conscious of the words he uses and their effects on others.

- Elaborates, clarifies, defines ideas, words and opinions others may not understand.

- Expresses ideas in complete thoughts.

- Uses analogies and concepts that are appropriate and correct for given situations.

AUTONOMY AND INDEPENDENCE

A critical and creative thinker tackles problems and does not avoid making decisions. He is self-motivated and curious, and he does not need direction from others to recognize what needs to be done. He is not afraid to think for himself.

Description of Autonomy and Independence:

- Motivates and directs self. (As opposed to relying on others to motivate her or provide her with direction.
- Displays a sense of wonder and curiosity about ideas, thoughts, and other aspects of life.
- Thinks and speaks for self. (Not dependent on others to suggest ideas, express opinions, or ask questions.)
- Demonstrates an "I can" and an "I enjoy" attitude about solving problems, dealing with frustrations, and other aspects of life.
- Takes a stand when evidence and reasons are sufficient to do so.

Adapted from:

Costa, Arthur. "The Behaviors of Intelligence." Developing Minds: A Resource Book for Teaching Thinking. Association for Supervision and Curriculum Development, 1985: 66-68.

Costa, Arthur. "How Can We Recognize Improved Student Thinking." Developing Minds: A Resource Book for Teaching Thinking. Association for Supervision and Curriculum Development, 1985: 288-290.

Moraine Park Technical College
Fond du Lac, Wisconsin

CRITICAL AND CREATIVE THINKING SKILLS

SELF-ASSESSMENT

INSTRUCTIONS: Using the scale of 1 to 5, rate your use of critical and creative thinking skills.

5 = ALMOST ALWAYS
4 = OFTEN
3 = SOMETIMES
2 = SELDOM
1 = HARDLY EVER

1.	Do you try to understand the points of view of others?	5	4	3	2	1
2.	Do you keep at a task or problem when faced with frustration or difficulty?	5	4	3	2	1
3.	Do you strive to be precise and accurate in your work?	5	4	3	2	1
4.	Do you stay on task? (as opposed to being easily distracted or looking for other things to do to avoid tackling the problem/task at hand)	5	4	3	2	1
5.	Do you conscientiously and consistently attend to the requirements and responsibilities of your job, course work, family and/or other commitments?	5	4	3	2	1
6.	Do you get your work done within a reasonable or expected time frame?	5	4	3	2	1

Subtotal: ________

7.	Do you consider information, ideas and/or opinions carefully? (As opposed to being judgmental and/or argumentative.)	5	4	3	2	1
8.	Do you think before you speak or write?	5	4	3	2	1

9. Do you explore problems, topics, situations systematically? (As opposed to repeatedly doing things by trial and error.) 5 4 3 2 1

10. Do you make sure you understand instructions before beginning a task or assignment? 5 4 3 2 1

Subtotal: ________

11. Do you use a variety of thinking strategies? (Brainstorming, PMI, C&S, visualizing, checklists, etc.) 5 4 3 2 1

12. Can you propose several ways of dealing with and/or solving problems? 5 4 3 2 1

13. Do you change your avenue of thought if and/or when reliable new evidence is presented? 5 4 3 2 1

14. Do you consider variables when analyzing information? 5 4 3 2 1

15. Are you able to come up with unique, interesting, or creative ways of looking at or solving situations, problems, or tasks you deal with? 5 4 3 2 1

16. Are you able to invent and/or recognize novel, creative images, relationships, and/or analogies. 5 4 3 2 1

Subtotal: ________

17. Do you plan, monitor, and evaluate your thinking before, during, and after problem-solving/decision-making? 5 4 3 2 1

18. Are you aware of how you think and why you think the way you do about the ideas, opinions, and situations you deal with? 5 4 3 2 1

19. Are you able to assess your use of critical and creative thinking behaviors and attitudes, and work on those you are weak in. 5 4 3 2 1

20. Are you aware of how your behaviors affect others? 5 4 3 2 1

21. Do you use environmental cues to determine appropriate behavior in given situations? (Do you consider what is, and is not appropriate given the place, time, and people involved?) 5 4 3 2 1

22. Do you consider the outcome of your actions and/or decisions before implementing them? 5 4 3 2 1

23. Are you aware of how and when your emotions affect your thinking? 5 4 3 2 1

Subtotal: _______

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24. Do you strive to broaden your knowledge both within and without your field? 5 4 3 2 1

25. Do you look for patterns or relationships in ideas, information, opinions and/or behaviors? 5 4 3 2 1

26. Do you organize information/ideas in a systematic way (classifying, categorizing, charting, mapping, etc.) in order to make sense of it for yourself and others. 5 4 3 2 1

27. Do you apply knowledge and skills learned in one area or experience to other areas and/or experiences? 5 4 3 2 1

28. Do you refrain from using past experiences as the only factor when analyzing a situation, opinion, or idea? 5 4 3 2 1

Subtotal: _______

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29. Do you recognize potential problems? 5 4 3 2 1

30. Do you recognize problems already in existence? 5 4 3 2 1

31. Are you able to accurately define problems? 5 4 3 2 1

32. Are you able to objectively analyze problems as to their causes and effects? 5 4 3 2 1

33. Do you recognize discrepancies in problems, ideas, opinions, and/or situations? (A discrepancy is something that does not fit with something else. This also includes the ability to recognize fallacies in thinking.) 5 4 3 2 1

34. Do you ask questions to clarify information, ideas, opinions? 5 4 3 2 1

35. Do you ask abstract, critical, creative and hypothetical questions when exploring problems and ideas? 5 4 3 2 1

36. Do you check to see that ideas, opinions, and evidence are reliable and relevant? 5 4 3 2 1

37. Do you recognize the need for, and search for necessary and complete information? 5 4 3 2 1

38. Are you able to determine the significance of problems, situations, and/or ideas? (Can you tell how important a problem is?) 5 4 3 2 1

Subtotal: _______

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39. Do you show a willingness to doubt or examine your beliefs? (As opposed to believing your way of looking at or doing things is the only way.) 5 4 3 2 1

40. Are you able to state arguments and/or evidence for opinions and ideas different from your own. 5 4 3 2 1

41. Do you acknowledge other points of view as having validity? 5 4 3 2 1

42. Do you recognize and work to overcome mental blocks and mindsets? 5 4 3 2 1

43. Do you avoid using absolutes in speaking, writing, and thinking? (Absolutes are words like all, none, never, everyone, etc.) 5 4 3 2 1

44. Do you work to overcome episodic, egocentric, myopic views of reality? (Are you able to put your past experiences in perspective?) 5 4 3 2 1

45. Do you express other people's ideas, points of view, and feelings accurately while conversing with them and when relaying information to others? 5 4 3 2 1

46. Do you tolerate ambiguity while searching for clarity? (Ambiguity refers to things that can be understood in more than one way.) 5 4 3 2 1

Subtotal: ________

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47. Do you apply rules, models, and/or criteria when completing activities? 5 4 3 2 1

48. Do you establish criteria and/or use prescribed criteria to evaluate your decisions, solutions to problems, and completed tasks? 5 4 3 2 1

49. Does your work reflect quality, craftsmanship, and accuracy? 5 4 3 2 1

50. Do you express your opinions and ideas objectively by using logical and relevant evidence? (As opposed to being irrational or emotional when expressing or defending ideas/opinions) 5 4 3 2 1

Subtotal: ________

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51. Do you use clear, specific, concrete and descriptive language in speaking and writing? 5 4 3 2 1

52. Do you use the English language correctly? 5 4 3 2 1

53. Are you conscious of the words you use and their effects on others? 5 4 3 2 1

54. Do you elaborate, clarify, and define ideas, opinions and words others may not understand? 5 4 3 2 1

55. Do you express your ideas in complete thoughts? (Do you use complete sentences when speaking and writing?) 5 4 3 2 1

56. Do you use analogies and concepts that are appropriate and correct for given situations? 5 4 3 2 1

Subtotal: _______

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57. Do you motivate and direct yourself? (As opposed to relying on others to motivate you or provide you with direction.) 5 4 3 2 1

58. Do you reflect a sense of wonder or curiosity about ideas, thoughts, and other aspects of life? 5 4 3 2 1

59. Do you think and speak for yourself? (As opposed to depending on others to suggest ideas, express opinions, or ask questions?) 5 4 3 2 1

60. Do you demonstrate an "I can" and an "I enjoy" attitude about solving problems, dealing with frustrations, and/or other aspects of life? 5 4 3 2 1

61. Do you take a stand when evidence and/or reasons are sufficient to do so? 5 4 3 2 1

Subtotal: _______

SCORING AND MEANING OF THIS ASSESSMENT

Excellent:	You apply effective critical and creative thinking skills regularly.
Improve Consistency:	You use critical and creative thinking skills occasionally but could work to be more consistent.
Needs Improvement:	You need to work at incorporating critical and creative thinking skills in your daily life.

****

Subtotals:		**Excellent**	**Improve Consistency**	**Needs Improvement**
1- 6	______	27-30	21-26	Below 21
7-10	______	18-20	14-17	Below 14
11-16	______	27-30	21-26	Below 21
17-23	______	31-35	24-30	Below 24
24-28	______	23-25	18-22	Below 18
29-38	______	45-50	35-44	Below 35
39-46	______	36-40	28-35	Below 28
47-50	______	18-20	14-17	Below 14
51-56	______	27-30	21-26	Below 21
57-61	______	23-25	18-22	Below 18
Total score:	______	274-305	213-273	Below 213

EXPLANATION OF THE ITEMS:

Items 1-6 deal with **PERSEVERANCE.** A critical and creative thinker does not give up when faced with frustration and difficulty. She attacks problems and decisions and stays with them until she finds a way to resolve them.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 7-10 deal with **DECREASING IMPULSIVE BEHAVIOR.** A critical and creative thinker looks closely and carefully at problems or situations. He tries to understand them before suggesting ways to deal with them. He pursues solutions systematically.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 11-16 concern **FLEXIBLE THINKING.** A critical and creative thinker considers alternate points of view or ways of dealing with problems and/or situations. She is able to offer many ways of looking at and solving problems and situations.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 17-23 deal with **METACOGNITION.** This means that a critical and creative thinker is able to think about how he thinks. He is able to describe necessary steps to take to deal with a problem or make a decision. He is aware of others and his effects on others.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 24-28 concern the **USE OF KNOWLEDGE.** A critical and creative thinker is like a squirrel preparing for winter. She knows how to and when to search for more information. She is open to new information and ideas. She transfers knowledge from one area of expertise to new and challenging situations.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 29-38 deal with **PROBLEM ORIENTATION.** A critical and creative thinker is not only able to work at solving problems or making decisions, but is also able to recognize or pose problems and decisions for consideration. He is able to ask questions and search for more information as needed for the situation.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 39-46 concern being **OPEN-MINDED.** A critical and creative thinker is aware that her way is not the only way to look at or do things. She does not see the world in black and white, good and bad terms. She recognizes that there are many facets to consider in problems, opinions, issues and ideas.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 47-50 refer to the **USE OF QUALITY STANDARDS.** A critical and creative thinker reflects on the accuracy and precision of his work and takes pride in his accomplishments. He is able to set forth personal standards of excellence as well as use objective standards for evaluation.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Items 50-56 deal with the **USE OF PRECISE LANGUAGE.** A critical and creative thinker uses descriptive and precise words to clarify and elaborate her ideas and opinions. She gives enough information and speaks and writes in complete thoughts so that her audience can understand what she is trying to communicate.

Items 57-61 concern being **AUTONOMOUS AND INDEPENDENT** in thinking and acting. A critical and creative thinker tackles problems and does not avoid making decisions. He is self-motivated and does not need direction from others to recognize what needs to be done. He is not afraid to think for himself.
Circle the category you scored in.
EXCELLENT IMPROVE CONSISTENCY NEEDS IMPROVEMENT

Adapted from

Costa, Arthur L., "How Can We Recognize Improved Student Thinking?" Developing Minds: A Resource Book for Teaching Thinking. Association for Supervision and Curriculum Development, 1985: 288-290.

Costa, Arthur L. "The Behaviors of Intelligence." Developing Minds: A Resource Book for Teaching Thinking. Association for Supervision and Curriculum Development, 1985: 66-68.

TEACHER BEHAVIORS AND ATTITUDES TO PROMOTE THINKING IN THE CLASSROOM

The following are teacher behaviors and attitudes that encourage students to think critically and creatively. The major categories are listed first as a summary. Specific behaviors and attitudes are described in a more detailed listing on the attached pages.

FOSTER A CLIMATE OF OPENNESS.

ENCOURAGE STUDENT INTERACTION AND COOPERATION.

DEMONSTRATE ATTITUDES OF ACCEPTANCE.

ENCOURAGE STUDENTS TO GATHER INFORMATION.

REQUIRE STUDENTS TO ORGANIZE INFORMATION.

ENCOURAGE STUDENTS TO JUSTIFY IDEAS.

EXPECT STUDENTS TO EXPLORE ALTERNATIVES AND OTHERS' POINT OF VIEW.

ASK OPEN-ENDED QUESTIONS.

USE VISUAL AIDS FOR UNDERSTANDING.

SET STANDARDS FOR QUALITY, USE OF LANGUAGE, AND EVALUATION.

MODEL AND PROBE FOR REASONING STRATEGIES.

ENCOURAGE TRANSFER OF KNOWLEDGE AND SKILLS.

PROMOTE REFLECTION, AUTONOMY, AND INDEPENDENCE.

A. **FOSTER A CLIMATE OF OPENNESS:**

1. Maintain eye contact with your students.
2. Move about the room as opposed to sitting at a desk or standing at a speaker's stand.
3. Encourage students to listen attentively to others during discussions.
4. Call on students by name.

B. **ENCOURAGE STUDENT INTERACTION AND COOPERATION:**

1. Have students work in pairs and/or small groups for some activities.
2. Encourage students to respond to each other.
3. Allow and encourage students to help others analyze and solve problems (especially when introducing new concepts or activities).

C. **DEMONSTRATE ATTITUDES OF ACCEPTANCE:**

1. Accepted valid student responses.
2. Respond to inaccurate responses with supportive comments to encourage students to clarify and/or rethink their responses.
3. Acknowledge student comments either verbally or nonverbally.

D. **ENCOURAGE STUDENTS TO GATHER INFORMATION:**

1. Make materials/resources available as needed for assignments or activities.
2. Help students make effective use of course materials.
3. Act as a guide or facilitator, and interact with students to accomplish course objectives.
4. Allow students ample opportunity to ask questions, seek information, and get feedback on assignments, grades, the structure of the course, etc.

E. **REQUIRE STUDENTS TO ORGANIZE INFORMATION:**

1. Work with students to accomplish the goals of the course.
2. Encourage students to classify and categorize information through note-taking.
3. Help students approach assignments and activities in systematic ways through thorough teacher explanations and handouts.
4. Present information to students that is logical, thorough, and organized.
5. Use a variety of methods to provide information to students. (Do not rely on lecture as the only tool for presenting information.)

F. ENCOURAGE STUDENTS TO JUSTIFY IDEAS:

1. Probe for accurate responses.
2. Ask for evidence or reasons for opinions or ideas.
3. Help students analyze sources of information for reliability and relevance.
4. Make "Why do you think so?" (or similar questions) the most frequently asked question.

G. ENCOURAGE STUDENTS TO EXPLORE ALTERNATIVES AND OTHERS' POINT OF VIEW:

1. Elicit numerous divergent solutions to problems posed in the classroom.
2. Allow students time to consider alternatives and other points of view.
3. Ask for solutions and ideas from more than one student.
4. Ask students to justify and explain their thoughts in oral, visual, and/or in written formats.

H. ASK OPEN-ENDED QUESTIONS:

1. Ask open-ended questions to get at multiple answers.
2. Encourage students to ask open-ended questions.

I. USE VISUAL AIDS FOR UNDERSTANDING:

1. Use a variety of visual media (charts, chalkboard, pictures, gestures, objects, overhead, audio-visuals...).
2. Use symbolic language to illustrate ideas and thoughts. (facial expressions, metaphors, gestures, anecdotes, visualization....)
3. Use mapping and/or outlining to organize information.

J. SET STANDARDS FOR QUALITY, USE OF LANGUAGE, AND EVALUATION:

1. Demonstrate appropriate use of the English language in writing and in speaking.
2. Elaborate, clarify, define ideas and opinions.
3. Use specific, concrete, descriptive language.
4. Establish and explain criteria for evaluation purposes.
5. Apply rules, models, and criteria when presenting and evaluating material.

K. MODEL AND PROBE FOR REASONING STRATEGIES:

1. Pose "what if" or "suppose that" questions.
2. Use clear examples to encourage logical, relevant thought.
3. Cite sources of information and explain their

reliability and relevance to the course material.
4. Ask students to expand on their answers.

L. ENCOURAGE TRANSFER OF KNOWLEDGE AND SKILLS.

1. Encourage students to apply the course competencies and information to their personal, work, and academic lives, as appropriate.
2. Provide examples or ideas for students to apply competencies and information to their personal, work, and academic lives.
3. Encourage students to relate learning to past experiences or similar ones.

M. PROMOTE REFLECTION, AUTONOMY, AND INDEPENDENCE:

1. Allow students time to think and reflect.
2. Expect that students think for themselves.
3. Help students assess their progress in the course.
4. Demonstrate "I can" and "I enjoy" attitudes about what you do.
5. Encourage students to develop and/or become aware of their "I can" and "I enjoy" attitudes.
6. Display a sense of wonder and curiosity.

SELF-ASSESSMENT OF TEACHER BEHAVIORS AND ATTITUDES TO PROMOTE THINKING IN THE CLASSROOM

The following are teacher behaviors and attitudes that encourage students to think critically and creatively. Evaluate your behaviors and attitudes as a teacher by circling one of the responses for each item.

Explanation of the responses:

YES = You always or usually do this.
S + = You do this when it is possible and appropriate for the situation.
S - = You do this sometimes but not as often as you should.
NO = You rarely, if ever, do this.

DO YOU:

1. Maintain eye contact with your students. YES S + S - NO
2. Move about the room as opposed to sitting at a desk or standing at a speaker's stand. YES S + S - NO
3. Encourage students to listen attentively to others during discussions. YES S + S - NO
4. Call on students by name. YES S + S - NO
5. Have students work in pairs and/or small groups for some activities. YES S + S - NO
6. Encourage students to respond to each other. YES S + S - NO
7. Allow and encourage students to help others analyze and solve problems (especially when introducing new concepts or activities). YES S + S - NO
8. Accepted valid student responses. YES S + S - NO
9. Respond to inaccurate responses with supportive comments to encourage students to clarify and/or rethink their responses. YES S + S - NO

10.	Acknowledge student comments either verbally or nonverbally.	YES	S +	S -	NO
11.	Make materials/resources available as needed for assignments or activities.	YES	S +	S -	NO
12.	Encourage students to make effective use of course materials.	YES	S +	S -	NO
13.	Act as a guide or facilitator, and interact with students to accomplish course objectives.	YES	S +	S -	NO
14.	Allow students ample opportunity to ask questions, seek information, and get feedback on assignments, grades, the structure of the course, etc.	YES	S +	S -	NO
15.	Work with students to accomplish the goals of the course.	YES	S +	S -	NO
16.	Help students classify and categorize information through note-taking.	YES	S +	S -	NO
17.	Encourage students to approach assignments and activities in systematic ways through thorough teacher explanations and handouts.	YES	S +	S -	NO
18.	Present information to students that is logical, thorough, and organized.	YES	S +	S -	NO
19.	Use a variety of methods to provide information to students. (Do not rely on lecture as the primary tool for presenting information.)	YES	S +	S -	NO
20.	Probe for accurate responses.	YES	S +	S -	NO
21.	Ask for evidence or reasons for opinions or ideas.	YES	S +	S -	NO
22.	Help students analyze sources of information for reliability and relevance.	YES	S +	S -	NO
23.	Make "Why do you think so?" (or similar questions) a frequently asked question.	YES	S +	S -	NO

24. Elicit numerous divergent solutions to problems posed in the classroom. YES S + S - NO

25. Allow students time to consider alternatives and other points of view. YES S + S - NO

26. Ask for solutions and ideas from more than one student. YES S + S - NO

27. Ask students to justify and explain their thoughts in oral, visual, and/or in written formats. YES S + S - NO

28. Ask open-ended questions to get at multiple answers. YES S + S - NO

29. Encourage students to ask open-ended questions. YES S + S - NO

30. Use a variety of visual media (charts, chalkboard, pictures, gestures, objects, overhead, audio-visuals...). YES S + S - NO

31. Use symbolic language to illustrate ideas and thoughts. (metaphors, gestures, anecdotes, visualization....) YES S + S - NO

32. Use mapping and/or outlining to organize information. YES S + S - NO

33. Demonstrate appropriate use of the English language in writing and in speaking. YES S + S - NO

34. Elaborate, clarify, define ideas and opinions. YES S + S - NO

35. Use specific, concrete, descriptive language. YES S + S - NO

36. Establish and explain criteria for evaluation purposes. YES S + S - NO

37. Apply rules, models, and criteria when presenting and evaluating material. YES S + S - NO

38. Pose "what if" or "suppose that" questions. YES S + S - NO

39. Use clear examples to encourage logical, relevant thought. YES S + S - NO

40. Cite sources of information and explain their reliability and relevance to the course material. YES S + S - NO

41. Ask students to expand on their answers. YES S + S - NO

42. Encourage students to apply the course competencies and information to their personal, work, and academic lives, as appropriate. YES S + S - NO

43. Provide examples or ideas for students to apply competencies and information to their personal, work, and academic lives. YES S + S - NO

44. Encourage students to relate learning to past experiences or similar ones. YES S + S - NO

45. Allow students time to think and reflect. YES S + S - NO

46. Expect that students think for themselves. YES S + S - NO

47. Help students assess their progress in the course. YES S + S - NO

48. Demonstrate "I can" and "I enjoy" attitudes about what you do. YES S + S - NO

49. Encourage students to develop and/or become aware of their "I can" and "I enjoy" attitudes. YES S + S - NO

50. Display a sense of wonder and curiosity. YES S + S - NO

EXPLANATION OF THE ASSESSMENT:

In order to become a more effective teacher for critical and creative thinking you should exam the items for which you circled "S -" and "No." These are the areas you should concentrate on working to improve.

CRITICAL AND CREATIVE THINKING

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WHITE BEAR LAKE'S

Institute for Professional Renewal

STAFF DEVELOPMENT TO IMPROVE
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Thinking Skills Workshop
Part II

Thursday, January 19, 1989
Friday, January 20, 1989

Presenter: Kathy Kelly

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Review

TEACHING THINKING

OF. . . . .

FOR . . . . .

ABOUT. . . . .

Teaching For, Of, and About Thinking

Arthur L. Costa

Ron Brandt's editorial in the September 1984 issue of *Educational Leadership* is one of the most helpful organizers for the teaching of thinking I've found. He discusses a balanced, three-part program, which I interpret as follows.

Teaching FOR Thinking

Many authors and psychologists feel that children learn to think long before they come to school and that educators need to create the conditions for their natural, human inclination to think to emerge and develop. Indeed, Hart (1975) believes that schools are "brain incompatible." In their studies of creativity, Ghiselin and Gardner find that what young children do prior to entering school and what practicing scientists and artists do is more similar than anything that goes on in between.

Teaching for thinking simply means that teachers and administrators examine and strive to create school and classroom conditions that are conducive to children's thinking. This means that:

1. Teachers *pose problems, raise questions*, and intervene with paradoxes, dilemmas, and discrepancies that students can try to resolve.

2. Teachers and administrators *structure* the school environment for thinking—value it, make time for it, secure support materials, and evaluate growth in it.

3. Teachers and administrators *respond* to students' ideas in such a way as to maintain a school and classroom climate that creates trust, allows risktaking, and is experimental, creative, and positive. This requires listening to students' and each other's ideas, remaining nonjudgmental, and having rich data sources.

4. Teachers, administrators, and other adults in the school environment *model* the behaviors of thinking that are desired in students.

Accomplishing all of the above alone would go far in encouraging students to use their native intelligence. However, there's more. Students haven't learned to think yet.

Teaching OF Thinking

Most authors and developers of major cognitive curriculum projects agree that direct instruction in thinking skills is imperative. Beyer, de Bono, Feuerstein, Lipman, and Whimbey would probably agree on at least one point: the teaching of thinking requires teachers to instruct students directly in the processes of thinking. Even Perkins believes that creativity can be taught—by design.

This does not mean that a curriculum program must be purchased, inserviced, and installed. While this is surely a viable option and should be considered, there are other ways of teaching students thinking skills: analyzing the subject areas or skills being taught in the normal curriculum for their prerequisite cognitive abilities and then teaching those skills directly, for example. The act of decoding in reading requires analysis, comparison, making analogies, inferring, synthesizing, and evaluating. Teaching of thinking, therefore, means that these cognitive skills are taught *directly* as part of the reading (decoding) program.

Critical thinking skills might be taught directly during a social studies unit on the election process. Steps in problem solving might be taught directly during math and science instruction. The qualities of fluency and metaphorical thinking might be taught directly during creative writing,

FIGURE 1
Staff Development Matrix for Thinking Skills

Levels of Skill Development	**I. Teaching For Thinking:** Creating school and classroom conditions conducive to full cognitive development	**II. Teaching Of Thinking:** Instructing students in the skills and strategies directly or implementing one or more programs	**III. Teaching About Thinking:** Helping students become aware of their own and others' cognitive processes and their use in real-life situations and problems
A. **Awareness** Developed by lectures, readings, witnessing demonstrations, and so on	I A	II A	III A
B. **Knowledge and Comprehension** Developed by modeling, practicing, comparing, discussing, interacting	I B	II B	III B
C. **Mastery of Skills** Developed by practicing with feedback and coaching	I C	II C	III C
D. **Application** Developed by extended use across subject areas, varieties of groups, demonstrations; critique and dialogue with others	I D	II D	III D
E. **Trainer of Trainers** Developed by creating, conducting, and critiquing inservice strategies; observing the training of other trainers	I E	II E	III E

and so forth. Creating conditions for thinking and teaching it directly are excellent procedures, but what about the application? Nothing yet has been taught about the transference of these thinking skills beyond the context in which they were learned. Students may be able to identify the steps in the problem-solving process and correctly distinguish between classification and categorization, but do they have any inclination to use these skills in real-life situations? There's more.

Teaching ABOUT Thinking

Teaching about thinking can be divided into at least three components: brain functioning, metacognition, and epistemic cognition.

1. *Brain functioning.* Recently neurobiological research has shed light on how our brains work. Teaching about thinking would include investigating such curiosities as: How do we think? How does memory work? What causes emotions? Why do we dream? How do we learn? How and why do mental disorders occur? What happens when part of the brain is damaged? Restak's ***The Brain***, Ornstein and Thompson's ***The Amazing Brain***, and Russell's ***The Brain Book*** are sources of information. A recent public television series entitled "The Brain" has heightened this awareness and is available for use in schools.

2. *Metacognition.* Being conscious of our own thinking and problem solving while thinking is known as metacognition. It is a uniquely human ability occurring in the neocortex of the brain. Good problem solvers plan a course of action before they begin a task, monitor themselves while executing that plan, back up or adjust the plan consciously, and evaluate themselves upon completion.

Metacognition in the classroom might be characterized by having discussions with students about what is going on inside their heads while they're thinking; comparing different students' approaches to problem solving and decision making; identifying what is known, what needs to

FIGURE 2
I. Teaching FOR Thinking

Intersection	Competencies of Teachers
I A	Is aware of different levels of questions and various ways of organizing the classroom for instruction. Can describe alternative ways of responding so as to maintain and extend students' thinking.
I B	Plans lessons to incorporate levels of questions, response behaviors, and classroom organization for thinking. Seeks assistance, advice from others in methods and materials for teaching thinking.
I C	Invites others to observe a lesson, then to give feedback about questioning skills, classroom organization, and response behaviors. Volunteers to do the same for colleagues.
I D	Incorporates thinking skills across subject areas. Devotes maximum time to teaching for thinking. Shares ideas and materials with colleagues. Strives to model rational thinking processes in own behavior.
I E	Conducts inservice for colleagues. Videotapes own lessons and shares with colleagues. Plans, conducts, and evaluates staff development strategies. Analyzes school and classroom conditions for their conduciveness to and modeling of thinking. Works to improve them.

FIGURE 3
II. Teaching OF Thinking

Intersection	Competencies of Teachers
II A	Is aware of various programs intended to teach thinking directly. Is aware of definitions and distinctions among various thinking skills and strategies.
II B	Employs lessons intended to directly teach thinking skills. Incorporates thinking skills into content areas. Attends training in a curriculum program intended to teach thinking directly.
II C	Invites others to observe and give feedback about lessons in which thinking is taught directly. Applies knowledge learned in training programs to instruction. Devotes two to three hours per week to teaching thinking directly.
II D	Distinguishes among several major curriculums intended to teach thinking. Diagnoses students' cognitive deficiencies and provides experiences to remediate them. Analyzes the cognitive skills prerequisite for students to master school subjects, and incorporates instruction in those skills.
II E	Develops and implements inservice training in one or more of the major curriculum programs. Trains others in the development of lesson plans incorporating direct instruction of thinking skills and strategies. Surveys and recommends adoption of instructional materials that enhance thinking skills.

be known, and how to produce that knowledge; or having students think aloud while problem solving.

Metacognitive instruction would include learning how to learn; how to study for a test; how to use strategies of question asking before, during, and after reading. It might include knowing how to learn best—visually, auditorily, kinesthetically—and what strategies to use when you find yourself in a situation that does *not* match your best learning modality.

Metacognition is discussed more extensively later in this book. See also Costa (1984).

3. *Epistemic cognition.* Epistemology is the study of how knowledge is produced. In the curriculum it might include studying the lives, processes, and works of great composers, artists, scientists, and philosophers. Epistemological questions for discussion include:

- How does what scientists do differ from what artists do?
- What are the procedures of inquiry used by anthropologists as they live with and study a culture?
- What goes on inside a maestro s mind as he or she conducts an orchestra?

FIGURE 4

III. Teaching ABOUT Thinking

Intersection	Competencies of Teachers
III A	Is aware of differences in modality strengths, learning styles, and brain functioning. Can define such terms as metacognition and epistemology.
III B	Attempts metacognitive discussions with students. Discusses how the brain works. Selects materials on brain functioning and biographies of famous scientists and artists in an attempt to intrigue students.
III C	Invites colleagues to observe a lesson involving a philosophical/epistemological discussion and seeks feedback as to ways to improve. Reads and attends courses and lectures, watches video programs on philosophy, cognition, brain functioning, and so on. Discusses differences in learning strengths and modalities with students.
III D	Selects materials and conducts lessons in which comparisons are made of strategic reasoning, knowledge production, and creativity. Discusses with students such topics as artificial intelligence, the analysis of propaganda, and strategies of learning. Models metacognition overtly in the presence of students.
III E	Develops, conducts, and evaluates inservice strategies for colleagues for instruction on brain functioning, learning style differences, and metacognition. Develops curriculum incorporating materials and learning activities intended to have students learn to think and learn about thinking. Designs assessment tools and techniques to gather evidence of students' growth in intelligent behaviors.

- What was it about Mozart's genius that allowed him to "hear" a total musical composition before writing it down?
- What process do poets use to create?
- Why can't we use processes of scientific inquiry to solve social problems.?

Epistemic cognition is the study and comparison of great artists, scientists, and scholars and the differential processes of investigation, inquiry, and creativity that underlie their productivity. Lipman's Philosophy for Children program is especially well-suited for this. Other resources include Perkins' *The Mind's Best Work*, Madigan and Elwood's *Brainstorms and Thunderbolts: How Creative Genius Works*, and Gardner's *Art, Mind, and Brain*.

Installing a Program for Thinking

Installing a program of teaching for thinking does not happen overnight. It takes time, patience, and practice. Joyce and others have created a helpful paradigm for thinking about the steps and sequences in staff development efforts. They suggest a series of stages and levels of concern through which teachers proceed during the change process. Their procedure includes inservice techniques that help teachers raise their skill development levels in using new skills and behaviors.

The matrix for staff development presented in Figure 1 combines two components—*teaching for, of, and about thinking* and the *levels of skill development*. Figures 2, 3, and 4 provide examples of teacher competencies, skills, and knowledge as indicators of what might be included at each intersection in the matrix. Please consider these examples merely as helpful starting points to which you can add your own indicators of competence.

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CHARACTERISTICS OF SKILLFUL THINKER

REVIEW

1. What are the characteristics of the skillful thinker?

2. How can and do educators foster these characteristics of the skillful thinker in their students?

NIGHT LINE

LEARNING-TO-LEARN SKILLS:

- attention control
- deep processing
- memory framework
- power thinking
- goal setting
- the responsibility frame

CONTENT THINKING SKILLS:

- concept attainment
- concept development
- pattern recognition
- macro-pattern recognition
- synthesizing
- proceduralizing

REASONING SKILLS:

- analogical reasoning
- extrapolation
- evaluation of evidence
- examiniation of value
- decision making
- non-linguistic patterns
- elaboration
- solving everyday problems
- solving academic problems
- invention

CONTENT THINKING SKILLS:

CONCEPT

WHAT IS A CONCEPT?

A concept is a set of specific objects, symbols, or events which are grouped together on the basis of shared characteristics and which can be referenced by a particular name or symbol.

Concept label

Concept characteristics

Concept examples

Concept Non-Examples

Grouping of Concepts

Objects:

Symbols:

Events:

MYSTERY CONCEPT

"____________________"

1
2

Concept Development

Sydelle Seiger-Ehrenberg

Ⓐ

Despite much talk about concept-centered curriculum, too many students still just learn facts. Teachers report, and tests show, that even those students who seem to have learned concepts often fail to apply them to new but similar situations.

Let's explore some of the possible reasons.

Different Concepts of "Concept"

One reason may be that educators haven't been sufficiently clear and consistent about what they think a concept is. They haven't distinguished between concepts and other things they want students to learn, such as facts, principles, attitudes, and skills. Fuzziness or lack of common understanding among curriculum developers, teachers, and testers about what a concept is could well account for disparity among what is taught, learned, and tested.

Lack of Understanding of Concept Learning/Teaching Processes

Another reason may be the assumption that concepts are learned (and therefore should be taught) in the same way facts are learned. While much attention has been given to differences in individual student learning "styles" (preferences related to *gathering* information), very little has been focused on the differences in various learning "strategies" (procedures for *processing* information). The process for learning and teaching concepts differs significantly from those appropriate for fact, principle, attitude, and skill learning. Lack of understanding of those differences on part of the curriculum developer or the teacher could certainly contribute to student failure to learn concepts.

Inadequate or Inappropriate Curriculum Material

Curriculum guides, teachers' manuals, and student materials may not contain enough of the right kind of information. Neither commercial nor locally developed curriculums may be thorough enough in identifying, defining, and relating the concepts students are expected to learn; of outlining appropriate concept-learning processes; or of presenting the kind of information students need in order to form concepts. Too often, the concept is just "presented" (as though it were a fact). Teachers who have to work with an inadequate or inappropriate curriculum may well be misled as to how to help students learn concepts, or, if they know better, are burdened with the task of revising or even developing the curriculum from scratch.

These may not be the only reasons students are not learning concepts as well as we think they should, but since these factors are under control, they should be addressed and, to the extent possible, eliminated.

Following are some ideas about concept learning and teaching which over the past 12 years many educators have learned and successfully applied. Their success came not from merely reading about or listening to these ideas, but as a result of hard work during and after intensive training in a staff development program called BASICS. This program and its predecessor, *The Hilda Taba Teaching Strategies Program*, focus on the thinking strategies students need to learn to achieve each of the basic types of learning objectives of any curriculum: concepts, principles, attitudes, and skills.

What Is a Concept?

Following are three *examples* of concepts.

1. Any plane, closed figure having just three sides
2. Any body of land bordered on all sides by water
3. Any invertebrate having just three body parts and exactly six legs

First, observe what each statement says. Note the *differences* among them. Then decide what is *true of all three statements*. What is true of all three is what makes all of them examples of "concept."

This subchapter originally appeared in Sydelle D. Ehrenberg, "Concept Learning: How To Make It Happen In The Classroom," *Educational Leadership* 39, 1 (October 1981): 36-43.

Now focus on the following three items. *None* of the three is a concept.

a. ABC is a plane, closed figure having three sides.
b. island
c. ant

Consider items "a," "b," and "c" one at a time. Compare and contrast each with the concept examples (#1, #2, and #3) and decide why "a," "b," and "c" are not examples of a concept. Item "a" states certain facts about figure ABC—its characteristics—but it does not state the characteristics common to any and all examples of that type of figure. Item "b" gives the English label for a type of thing but does not state the set of characteristics common to any and all examples. Item "c" gives the name of one example of concept #3, insect, but it does not state the characteristics common to any and all examples of insects, distinguishing all insects from any non-insect.

Based on the above, consider the following definitions and examples:

Concept—the set of attributes or characteristics common to any and all instances (people, objects, events, ideas) of a given class (type, kind, category) *or* the characteristics that make certain items examples of a type of thing and that distinguish any and all examples from nonexamples.

Concept Label—one or more *terms* used to refer to any and all examples of a given concept.

Examples—any and all *individual items* that have the characteristics of a given concept (class).

Nonexamples—any and all *individual items* that may have some but not all the characteristics that make items examples of a given concept (class).

The concept is the set of characteristics, not the label. A person can know the label for a concept without knowing the characteristics of any and all examples and vice versa. A concept is not the same as a fact. A fact is verifiable information about an individual item, while a concept is a generalization in a person's mind about what is true of any and all items (even those the person has never seen) that are examples of the same class.

A few additional points about concepts:

All concepts are abstract. This is so because a concept constitutes a generalized mental image of the characteristics that make items examples. However, the characteristics of individual items may be either concrete (*all* of the characteristics are perceivable, as in an apple) or represented in some way. A representation may be quite "concrete" (many of the characteristics are perceivable, as in a model, film, or photo) or quite "abstract" (few or none of the characteristics are perceivable, as in a diagram, symbol, spoken or written description). A common misconception is that young children cannot conceptualize because they cannot yet form abstract ideas. Actually, young children can and do conceptualize but only when the characteristics of examples of the concept are perceivable directly through the senses and they have the opportunity to perceive those characteristics firsthand in several individual items. They need these sense perceptions to form the generalized mental picture of the characteristics. (Is it any wonder that young children have so much trouble forming such [illegible]cepts as "sharing" and "tidiness"?)

Ⓑ *Concepts cannot be verified, like facts, as being "right" or "wrong."* Although it is difficult for us to realize, our concepts are not what is but what we have learned to think is. As a cultural group, over time, we decide what things are and what to call them. We store our current sets of characteristics and the concept labels that go with them in the dictionary and this becomes our "authority" to arbitrate any dispute. However, we all know how dictionaries

Ⓐ

FIGURE 1
Concept Examples

CONCEPT LABEL	CONCEPT CHARACTERISTICS	EXAMPLES	NONEXAMPLES
Compound Word	Any word whose meaning is a combination of the meaning of the root words of which it is composed.	Nightgown Oversee Doorknob	Carpet Begun Understood
Fruit	The part of any plant that contains the seed(s).	Apple Tomato Squash	Potato Celery Carrot
Improper Fraction	Any fraction whose numerator is equal or greater than its denominator.	$8/7$ $16/16$ $4/1$	$7/8$ $4/16$ $1/4$

differ and that dictionaries need to be updated periodically to keep up with our changing concepts that are newly-developed and commonly agreed on.

If you want to test this idea about concepts, see how many different explanations you get when you ask several people whether each of the following is a "family" and why they think it is or is not:

—A husband and wife with no children
—Several friends sharing the same home
—Roommates at college
—A separated husband and wife each having one of their children
—A mother and grown daughter living together.

Concepts are hierarchical; that is, some classes include other classes. Living things include plants and animals; animals include vertebrates and invertebrates; vertebrates include mammals, fish, birds, amphibians, and reptiles; and so on. My dog Spot is a specific example of every one of the classes in the hierarchy until he separates out into the canine class because some of his characteristics distinguish him from examples of feline, equine, and so forth. Not only that but, by virtue of the unique characteristics that distinguish him from other mongrels in the world, Spot is himself a concept (in a class by himself).

We've already made the distinction between "concept" and "fact." Let's now consider the relationship between concepts and the other types of learning: principles, attitudes, and skills.

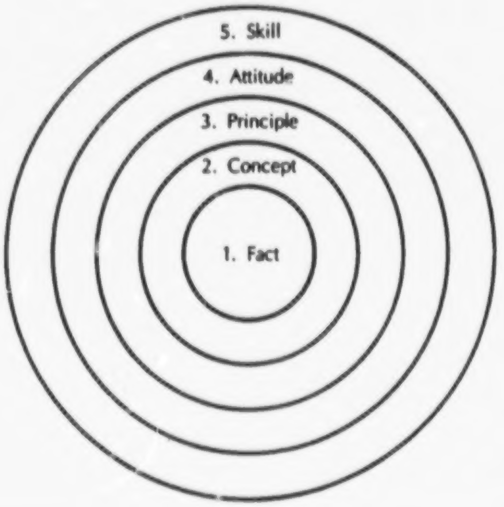
5 1. *Fact:* Verifiable information obtained through observing, experiencing, reading, or listening. Evidence of acquisition, comprehension, retention, and retrieval of information is the learner's expression of the specific, accurate, complete, relevant information called for.

2. *Concept:* Mental image of the set of characteristics common to any and all examples of a class. Evidence of conceptualization is the learner's demonstrated ability to consistently distinguish examples from nonexamples by citing the presence or absence of the concept characteristics in individual items.

3. *Principle:* Mental image of the cause-effect process which, under certain conditions, occurs between examples of two or more concepts. Evidence of understanding of the principle is the learner's demonstrated ability to make well-supported and qualified inferences of either cause or effect in new or changed situations.

4. *Attitude:* Mental set toward taking some action based on the desirability of anticipated consequences. Evidence of attitude learning is newly-acquired willingness to take (or refrain from) an action based on the learner's concept of what the action is and his or her predictions as to the desirable or undesirable effects of taking (or not taking) the action.

FIGURE 2
Levels of Learning



5. *Skill:* Proficiency and speed in performing a mental or physical action or set of procedures. Evidence of skill learning is the learner's performance of the action/procedures at the desired level of proficiency or speed and, where applicable, a product that meets desired standards for quality and/or quantity. This performance is based on the learner's concept of the action, his or her predictions as to the effects of performing one way or another, and his or her internalization of the procedures through repeated practice.

It is important to note, in Figure 2, that concept learning is distinctly different from any of the other levels of learning; therefore, the evidence of achievement is different. You can't, for example, appropriately test understanding of a concept by having the learners state facts or perform a skill. Note also that each level is prerequisite to and an important component of the next level of learning. This being the case, fact-learning is necessary but not sufficient to concept learning, and concept learning is necessary but not sufficient to the learning of principles, attitudes, and skills. (Paradoxically, the learner needs to develop a certain degree of thinking, listening, and reading *skill* before achieving even the fact-learning level.)

Ⓑ stops here

What Learning/Teaching Strategies Develop Concepts?

Fundamental to helping students learn concepts is understanding that conceptualizing has to take place in the mind of the learner. That is, the learner needs to establish in his/her own mind a mental image of the set of characteristics that makes something an example of the concept and that distinguishes examples from nonexamples. If the learner has access only to the concept label and a definition (all words), his/her mental image of the characteristics of examples of the concept may be vague, inaccurate, or nonexistent. Being able to accurately state a definition one has read or heard amounts only to fact-level learning, not conceptualization; the learner is only recalling words.

One who has conceptualized, on the other hand, is able to consistently identify new examples, create new examples, distinguish examples from nonexamples, change nonexamples into examples, and, in every case, is able to explain what he/she has done by citing the presence or absence of the concept characteristics. The learner can do this because he/she is guided by a clear mental image of the characteristics that should be there.

There are a number of strategies through which the learner can be guided so that he/she gathers the appropriate information, processes the information appropriately, and ends up with his/her own clear mental image of the concept characteristics.

For example, using an inductive strategy from the BASICS Program, a teacher might have students record on worksheets information about the physical characteristics and life cycles of ants, grasshoppers, moths, and mantises. When the information has been reported, verified, and recorded on a large wall chart, the teacher would ask questions intended to direct students' attention to differences among the examples and then to characteristics common to all examples. Students would be asked to formulate a statement specifying "What is true of all invertebrates like these?"

After giving (or asking students for) the concept label "insect," the teacher might have students complete another worksheet calling for information about the characteristics of spiders, centipedes, scorpions, and earthworms. The learning sequence would be completed by having students respond to:

> According to this information, what are some of the characteristics of these invertebrates that make them like insects?
>
> What was true of the insects that is not true of any of these other insect-like invertebrates?
>
> Based on what you've said here, finish the statement, "What makes insects different from other insect-like animals is ______."
>
> Identify the animals shown here which you think are insects and the ones you think are not. For each be ready to tell what about the animal made you decide it was or was not an insect.

Using a deductive (classifying) strategy a teacher would first present information about characteristics of all examples of the concept (a definition) along with the concept label. For the concept "contraction," for instance, the teacher might ask students to state in their own words what they had read was true of all contractions. Next, students would be asked to identify and verify the characteristics in each of several examples of the concept. For instance the teacher might say, "In the sentence, 'The girl's here,' the word *girl's* is an example of a contraction. Referring to the definition we just discussed, what about *girl's* in this sentence makes it an example of a contraction?"

Next, students would be asked to note the absence of one or more of the concept characteristics in each of several nonexamples. For example, the teacher might say, "In the sentence, 'The girl's coat is here,' the word *girl's* is not a contraction. Referring to our definition, what about *girl's* in this sentence makes it not a contraction?"

Then students would develop generalized personal statements giving characteristics of all examples of the concept and characteristics that distinguish examples from nonexamples. Finally, the teacher might have students identify which underlined words in a group of sentences were contractions and which were not. Students would be expected to explain what made each an example or a nonexample of contractions.

From these examples you can see there are certain common elements to concept-learning strategies:

1. Students must focus on several examples of the concept.
2. Students must gather and verify information as to the *concept-relevant characteristics* of each individual example and nonexample.
3. Students must note how the examples vary and yet are still examples of the concept.
4. Students must note what is *alike* about all the examples of the concept.
5. Students must generalize that what is alike about all the examples they've examined is also true of all other examples of the concept.
6. Students must note how the nonexamples resemble examples, but, particularly, how they *differ* from them.
7. Students must generalize about the characteristics that *distinguish* all examples of the concept from any item that might resemble them in some way.

What Should Curriculum Materials Provide?

You might find it useful and enlightening to check number of curriculum guides and text materials to see how concepts are introduced. How often is there nothing more than words: the concept label and a definition? If examples are presented, are the concept characteristics clearly identified in each example, or is it assumed that the reader can and will identify the right ones?

For curriculum materials to promote concept development:

1. Concepts should be clearly identified as concepts (not facts, principles, attitudes, and skills).
2. Concepts should be clearly stated in terms of the set of characteristics by which examples are identified and by which examples can be distinguished from nonexamples.
3. Several good examples and nonexamples should be suggested or provided for use with students.
4. One or more appropriate concept development learning sequences should be outlined for each concept. These should state clearly what the learner needs to do at each step of the sequence and what the teacher might provide, do, or say to guide students through the conceptualizing process.
5. Appropriate concept testing and reinforcing activities should be included (as in our example of having students distinguish contractions from possessives). Each should require students not only to identify new examples but also to cite the presence (or absence) of the concept characteristics.

None of the foregoing ideas is new. Nor is reading and understanding them all that is needed to make concept learning a consistent reality in the classroom. To conceptualize these ideas, the reader needs to encounter and deal with a number of examples and nonexamples of their use in the classroom. To develop skill in the use of concept learning/teaching strategies requires not only conceptualization, but firsthand experience with their results with students, willingness to take the required action to achieve the desired results, and enough practice and application to make the learning and teaching strategies an integral part of both curriculum and instruction.

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GUIDELINES: How to Decide if a Concept Lesson is Needed.

You decide, but consider:

New Terms - Whenever you want the learner to "understand," "know how to use," or "know the meaning of" a new term then a concept lesson is in order.

Definitions - Whenever lesson material calls for the student to define new words, a concept lesson is probably needed.

Rule Using - If the concent you are teaching involves rule-using behavior, examine each rule and prepare a concept lesson for the important concepts involved.

List the Steps - Whenever the concept suggests a series of steps, examine each step and decide whether it justifies a separate content lesson.

Identify Parts - If the lesson materials call for the learner to identify parts, examine the task and decide if some of the part to be identified should be taught as concepts.

CONTENT THINKING SKILLS:

CONCEPT ATTAINMENT

OR

CONCEPT DEVELOPMENT

UNIT 7: CONCEPT ATTAINMENT

Concept attainment is the tactic of associating experiences with a word commonly used to represent those experiences.

The process of teaching a concept using this model is as follows:

1. Provide a direct or indirect experiential base about the new concept for the new concept for the students by a field trip, classroom activity, discussion describing the concept and/or giving some personal examples of your experiences of the concepts.

2. Have students describe the new concept in terms of their experiences.

3. Using the information generated in Step #1, have students for a strong mental image of the new concept.

4. Have students say the word (the phonemic label for the concept) to themselves so that they can hear it in their mind's ear.

5. Have students see the word (the orthographic label) in their mind's eye.

6. Have students systematically review the newly learned concept adding and deleting information.

Example Strategy for Introducing Concept Attainment

1. Present students with a very simple concept they already know and ask them to identify what comes to mind when they hear the word (e.g. "In a minute I'm going to say a word. When I say the word, try to identify what you think about when you hear the word. Ready? The word is dog").

2. Have students share their experiences with the class. As they share experiences, write their responses on the board.

3. Using students' responses, demonstrate that knowing a word is actually knowing a "label" for a set of experiences.

4. Point out that you commonly don't think of a "definition" when you hear a word but you do commonly talk to yourself about the word. Have students try to "hear" what they say to themselves about the concept presented to them.

5. Point out that you also have mental pictures, sensations and emotions associated with a word. Have students identify the mental pictures, physical sensations and emotions they associate with the concept

6. Present and model the concept attainment process. Use the concept previously presented to the students.
7. Explain that you will be asking students to use the concept attainment process as they learn new words.
8. Have students use the concept attainment process on a new concept you want them to learn.

CONCEPT ATTAINMENT PRACTICE SHEET

UNIT 8: CONCEPT DEVELOPMENT

Concept development is the tactic of identifying 1) the category and example of, 2) similar and dissimilar concepts for, 3) the attributes of and 4) the definition of a concept already attained.

Background Information

In the unit on concept attainment we discussed the fact that you can attain a concept without having a very technical or detailed understanding of it. However, in some cases it is necessary to know a concept in a very rigorous manner (e.g. when you are working in a scientific area). A detailed or technical knowledge of a concept usually includes the following:

- knowledge of the class or category to which the concept belongs,
- knowledge of examples of the concept,
- knowledge of similar concepts,
- knowledge of dissimilar concepts,
- knowledge of the attributes of the concept, and
- knowledge of the definition of the concept.

Usually, over time, a student will fill-in some of this information about a concept if s/he has repeated exposure to the concept. That is, if a student encounters a word many times s/he will naturally identify similar concepts, dissimilar concepts, etc. However, the process of concept development can be made more efficient if the components of a well developed concept are directly taught and reinforced. To this end students can be provided with a fairly simple process for concept development.

To develop a concept:

1. Identify the class or category to which the concept belongs.

2. Identify examples of the concept.

3. Identify concepts which are similar to it and state how they are similar.

4. Identify concepts that are dissimilar to it and state how they are dissimilar.

5. Identify the attributes of the concept.

6. Define (not describe) the concept.

It is important to realize that not all six steps about apply to all concepts. Specifically, some concepts have no examples; for others it is very difficult to identify a class or category to which they belong. One of the more difficult parts of the process is Step #5--identifying the "attributes" of the concept. The intent of this step is that students identify attributes or characteristics of the concept which seem to make the concept different from others -- attributes that seem important to the concept. Below is a list of attributes that are usually important to object concepts (e.g., persons, places, things), action concepts (e.g. concepts usually expressed as verbs) and event concepts.

Object Concepts

- o The object usually performs a specific action (scissors).
- o A specific action is usually performed on the object (a punching bag).
- o The object is usually used as an instrument or tool in an action (a baseball bat).
- o The object is made or produced in a certain way (wine).
- o The objective is a part of something (a wheel).
- o The object can have parts or can be divided up (a country).
- o The object has specific characteristics relative to its taste, feel, smell, sound, color (e.g., cake, silk, a skunk, a horn, a cloud).
- o The object can have specific characteristics relative to:
  - number/quantity (ants).
  - location (Denver).
  - dimensionality (a diamond).
  - emotion states (a witch).
- o The object can have specific characteristics relative to:
  - popularity (a pet rock).
  - commonness (a diamond).
  - danger (a gun).
  - value (a diamond).
  - freedom (a slave).

Action Concept

- o There is a specific person/thing who usually performs the action of the concept (march).
- o There is a specific instrument used in the action (swing).
- o Something gets produced from the action (baking).
- o As a result of the action someone/something changes state relative to its:
  - smell, taste, feel, sound, color (fumigate, sweeten, wrinkle, tune, paint).
  - number/quantity (multiply).
  - direction (direct).
  - dimensionality (build).
  - time/duration (shorten).
  - freedom (capture).
  - emotional state (anger).
  - popularity (dislike).
  - commonness (endanger).
  - certainty (question).
  - danger (threaten).
  - value (devalue).

    - intensity (lessen).
- There is a specific process involved in the action (bake).

Event Concept

- The event has specific participants who are normally involved (wedding).
- The event involves a specific process (football game).
- The event has a specific reason or causes specific results (festival).
- The event occurs at a specific time (lunch).
- The event has a specific duration (dinner).
- The event has a specific location (breakfast).

The list above is not meant to be exhaustive (e.g. identify all of the attributes which relate to a concept). It is simply meant as a tool to help teachers and student identify those attributes which seem to be key to a particular concept.

Sample Strategy for Introducing Concept Development

1. Present students with a concept that they have already attained, (e.g. "dog"). Have them write all the information they can think of about the concept within a given period of time. Allow students to share their answers with the class.

2. In small groups have the students identify the category or class to which the concept belongs. Have each group report their findings and come to a class decision as to the best category to represent the concept.

3. Again in small groups have students identify examples of the concept along with concepts that are similar and concepts that are dissimilar within the major category.

4. As a whole class discuss the important attributes of the concept based on what was learned from the previous activity.

5. Finally have students write a definition of the concept.

6. Next have students read what they had written about the concept at the beginning of the class. Have them compare their level of knowledge of the concept at the end of class with what it was at the beginning. Emphasize the fact that their knowledge base has deepened and become far richer.

7. Explain to students that they have just gone through the concept development process. Present and model the process for students.

8. Describe situations in which you will be asking them to use the concept development process.

9. Have students use the concept development process on a content area concept.

Concept Name

Category

Examples of Concept	**Similar Concepts**	**Non-Examples**

Attributes

Definition

Reflections

Topic: ____________________

CONTENT THINKING SKILLS:

PROCEDURALIZING

UNIT 12: PROCEDURALIZING

Proceduralizing is a tactic of breaking a complex process into its component parts and then systematically learning that process until it becomes automatic.

The process of proceduralizing a new skill is:

1. Identify the sequence of steps necessary to perform the task.
2. Write the steps down.
3. Before performing the task, read over the procedure you have written and mentally picture yourself performing the procedures.
4. Occasionally revise your procedure adding or deleting steps to make it better.
5. When the procedure becomes automatic disregard your description.

Sample Strategy for Introducing Proceduralizing

1. Ask students to recall a time when they learned how to perform a fairly complex skill like riding a bike or playing the piano. Have them vividly recall that experience for a while and then have them share their experiences with the rest of the class.
2. As students are sharing their experiences record on the blackboard examples of the three phases people pass through when they learn a complex skill: 1) a stage where they can describe the way you are supposed to perform the skill but they cannot perform the skill; 2) a stage where they can actually perform the skill but they are still learning some important things to do and some important things not to do; 3) a stage where they can perform the skill without thinking very much about it.
3. Explain that the proceduralizing process is simply a formal way of learning a complex skill and that it is something they have already done.
4. Present and model the proceduralizing process to students.
5. Describe situations in which you will expect them to use the process.
6. Present students with a content area process you want them to proceduarlize. Steps 1 and 2 should already be completed for them.
7. Systematically present students with important content area processes to proceduralize gradually shifting responsibility for Steps 1 and 2 over to them.

WORKSHEET: PROCEDURALIZING

DIRECTIONS: Proceduralizing is breaking a complex process into its component parts and gradually incorporating the process into your behavior. In the space below, proceduralize the task.

1. Identify (brainstorm) the sequence of steps necessary to perform the task.

2. Write the steps down.

3. Before performing the task, read over the procedure you have written and mentally picture yourself performing the procedure.

4. Occasionally revise your procedure adding or deleting steps to make it better.

5. When the procedure becomes automatic, disregard your description.

REASONING SKILLS:

ANALOGICAL

UNIT 13: ANALOGICAL REASONING

Analogical reasoning is a tactic for identifying how one set of concepts has relationships similar to those found in another set of concepts.

The process of solving an analogy problem has the following steps:

Step 1: Identify relationships between the two elements in the first set.

Step 2: Identify which element in the first set is most closely related to the single element in the second set.

Step 3: Identify an element which would make the second set of elements have the same relationship as the first set.

Sample Strategy for Introducing Analogical Reasoning

1. Present students with a familiar analogy from their own environment. For example you might state: "Schools and students have a relationship which is similar to the relationship between homes and children. Describe the relationship shared by these two sets of elements."
2. After discussing student's answers, explain that this type of reasoning is called analogical reasoning. Go over the format of an analogy problem.
3. Present and model the process for solving analogies.
4. Explain that on tests there are some common relationships that are used.
5. Present the nine (or fewer) common semantic relationships to students and have them create an analogy for each of the nine types.
6. Select one or more of the analogies students have created and show how other relationships could be identified which would create other analogies.
7. Explain to students that sometimes you will ask them to create analogies which are examples of the nine basic relationships, other times you will be asking them to create analogies where the relationships go beyond those nine.

Analogical Reasoning Worksheet

An Educator is like what household object?

____

Because____

Have the first one done?

Try for some more . . . . . .

____

____

____

____

____

____

____

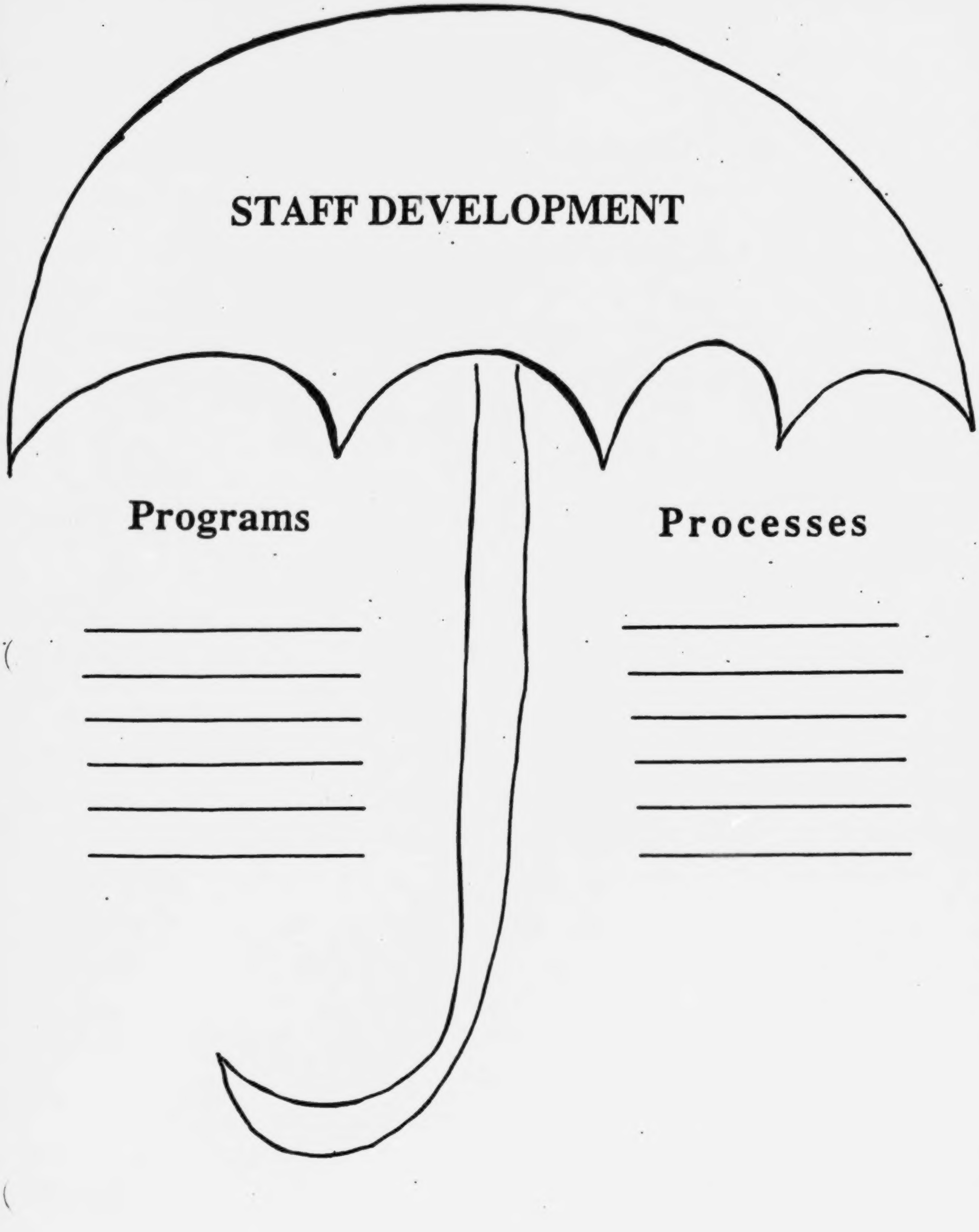
____

____

Reflections

Topic: ______________________________

WHAT IMPLICATIONS DOES THIS HAVE FOR ME, FOR MY CONTENT AREA?


STAFF DEVELOPMENT
Programs
Processes

PEER	**COACH**
SUPERVISOR	**EVALUATION**

WHAT IS PEER COACHING

. . . . a process which provides colleagues the opportunity to extend workshop content and skills into the classroom setting by creating a forum for interaction regarding teaching and learning.

Peer -

Coach -

Forms of Coaching

Technical

Collegial

Challenge

PEER COACHING...DOES IT WORK?

by Linda Shalaway

SON "A"

PEER COACHING...strategy that increases teacher professionalism while facilitating major changes in practice and ensuring that teacher training transfers to classroom.

There are a least 70 coaches in Eugene, Oregon's 4-J School District. But only a few have anything to do with athletics. Most are "peer coaches"...teachers helping other teachers to improve their teaching.

Once every week or two, coaches observe another teacher using a new teaching strategy to teach a lesson. They take notes on what they see and hear. Later, they meet with the teacher to offer some technical advice and moral support.

It's all part of a comprehensive inservice training program developed by Beverly Showers and her colleagues at the University of Oregon and the University's Center for Educational Policy and Management.

Teachers visiting each other's classrooms...helping each other plan lessons...experimenting together with new teaching strategies...talking about instructional theories. In a profession traditionally characterized by isolation from peers and colleagues, coaching is a stic change. But then, it is intended to produce drastic changes, ys Showers.

OCESS FOR CHANGE

Peer coaching is a process for making substantial change in teaching practice. "With the current emphasis on greater cognitive skills and higher-level thinking, teachers need to make fundamental changes in practice and how they relate to kids," says Showers. "Peer coaching helps achieve this."

How? By giving teachers long-term support and encouragement, not just one-shot training. Coaching is an expanded form of training, Showers explains.

Research that has been underway since 1981 has convinced Showers and her colleagues that coaching is vital to the inservice training of teachers. Without it, they've found, the new strategies and skills teacher learn never reach the classroom.

"If you are asking people to make fundamental changes in practice, peer coaching is important," says Showers.

WHY TRAINING DOESN'T TRANSFER

owers research and other studies show that even after teachers learn new teaching strategies and have demonstrated they know how to use them, they rarely apply the new strategies in the classroom. That is, the training doesn't transfer.

Why? There are several reasons, says Showers.

First, the classrooms are considerably different from training sessions, so new strategies have to be adapted to individual situations, students and curricula, she points out. That takes time and practice.

Also, practice without feedback does not give a classroom teacher any basis for improvement. Further, most training is not extensive enough to give teacher's the help they need. And, in most schools, there is no one to support or encourage the teacher struggling with new teaching strategies.

Peer coaching is the process that solves these problems.

"Peer coaching increases significantly the ability of teachers to transfer new models of teaching into their instructional repertoire," Showers has found.

"Coaching (is the) combination of several elements: the provision of companionship, the giving of technical feedback and the analysis of application," writes Showers in a report of her work.

PAIR UP IN COACHING

Ideally, say Showers and Green, coaching works best in pairs, where two teachers who are both attempting the same teaching strategies take turns observing each other once a week. Each observation is then followed by a meeting where the coach offers feedback and helps his or her partner plan future lessons.

Coaches become partners in experimentation says Showers. She notes that the coaching relationship allows for mutual perceptions the sharing of frustrations and successes and the reasurance that problems are normal.

Collegiality is a natural outcome of this process. And collegiality leads to increased professionalism.

Further, successful coaching relationships do not appear to depend on established friendship patterns, Showers reports.

"The often-lonely business of teaching has sorely lacked the companionship that is possible in coaching teams."

But collegiality and companionship, while important elements, are not the major purpose of coaching.

PERSON "B"

ching is a means for making major changes. Showers insists. It is a cess of technology to assure that training transfers to the classroom.

"Without specific goals, this strategy loses its momentum," she adds.

TECHNICAL FEEDBACK

Technical feedback is another important element of coaching. Technical Feedback means specific information of the execution of relevant skills or strategies. It does not mean judgment on the overall quality of teaching, Showers stresses.

She explains that coaches pick out omissions, examine how materials are arranged, and check to see whether all the parts of the teaching strategy have been brought into play. Using Technical Assessment Forms coaches record the presence or absence of specific behaviors and how thoroughly they are performed.

This technical feedback is apparently critical in the successful transfer of training. In one study, Showers found that, "Uncoached teachers practiced as much or more with the new strategies in their classrooms (as the coached teachers). Their practice, however, did not result in increasesd skill with the models, more appropriate use of the strategies increased student comfort with new instructional patterns."

N TO USE STRATEGY

The third important element of coaching is the analysis of application...helping the teacher figure out when to use a new method or strategy.

Selecting the occasions for the use of a teaching strategy is not as easy as it sounds." Showers notes. "The coaching context provides an opportunity for examining goals, curriculum and materials, and thinking about appropriate use of a newly acquired skill or behavior."

"Coaching conferences take on the character of collaborative problem-solving sessions, which often conclude with joint planning of lessons the team will experiment with. Shower continues, "The teacher experiments with a new lesson while the coach observes, and the experimentation continues with a new cycle of analysis, study hypothesis-forming and testing."

Thus through coaching, professional teachers engage in the continuous study of teaching.

MUST LEARN SKILLS

t coaching skills, just like new teaching strategies, must be learned. owers has experimented with several ways to train coaches. "It's evolving all the time," she comments.

In her 1982 and 1983 studies of coaching, for example, Showers worked with coaches throughout the school year. All of the peer coaches had completed prior training in the strategies the coached teachers were just learning, yet they all expressed initial uncertainty in their ability to be coaches. Showers found that these coaches benefited from continuing access to a consultant. And she further recommends continuing work on the content of training as well as the process of coaching.

Her approach now is to teach pairs of teachers to coach each other at the same time they are receiving the initial training in new teaching strategies.

ESTABLISH SUPPORT SYSTEM

Cynthia Turley, one of two district teachers on special assignment to train other teachers. Statements that, "Our goal down the road is to establish support systems within buildings. Where teachers needing training would come to us with a partner to get that training."

"Learning new teaching strategies is difficult and demanding." Turley continues. "We make mistakes, get discouraged, and we need the support and knowledge that coaching provides.

LAB APPLIES RESEARCH TO PRACTICE

Applying the coaching strategies researched and developed by other NIE-funded R&D institutions, McREL works extensively with a variety of school districts through its Effective School Program.

An integral part of this systematic staff development program designed to foster self-sustained self improvement efforts at the school building level, coaching emerges as a powerful strategy, according to Robert Ewy and Susan Everson, McREL staff members who work with the schools.

Ewy and Everson have found that the addition of coaching techniques to the other strategies used in the Effective Schools Program produces high levels of knowledge mastery, skill acquisition and classroom application.

"The strength of coaching rests on the total effect of theory, demonstration, practice and curriculum," Ewy says. "The general atmosphere of wanting to improve, a high level of trust and the sense that people care about each other and are willing to help each other must exist as preconditions to coaching.

PERSON "C"

PEERS MAKE BEST COACHES

Coaches can be teachers, supervisors, principals, college instructor one competent in using the teaching strategies they are coaching, says owers. But she is quick to point out that peers...other achers...usually make the best coaches.

"It's best to have someone else watch you who is taking the same risks or having the same problems." New teaching strategies are something teachers won't be good at, at first. They need a comfortable, non-threatening situation in which to practice and experiment with new skills, she explains.

SOME ARE THREATENED

Apparently, even peer coaching is threatening enough for some people. The coaching studies have shown that a small number of teachers resist coaching efforts. They can't seem to find time to schedule meetings with their coach, or they are not receptive to feedback and suggestions.

Green explains that, "In our culture, the norm is to not work with others. It's just too threatening to some people, although intellectually it appeals to them."

PRINCIPAL MUST HELP

Here's where the school principal can help...must help.

een and Showers both agree that it is the principal's job to establish w norms...norms that reward collaboration among teachers and the ongoing study and improvement of teaching. That previous research reveals little school support for teachers' professional endeavors.

"Professional growth must be seen as valuable and expected." Showers maintains. "The invaluable role of principal's in facilitating coaching programs cannot be too strongly emphasized."

Principals must also work with the central administration to set priorities and allocate the time and resources necessary for such intensive training.

Principals need support, too, says Marilyn Clotz, principal of the 4-J District's Cal Young Middle School. Clotz is currently on a study leave working with Green and others to build a support system for principals who are implementing coaching in their schools.

"I'm sold on the idea that coaching is the way new skills are learned," says Clotz. "But it works because of all the follow-up activity, and that takes time."

IS IT WORTH THE EFFORT?

me...effort...commitment...is peer coaching worth all this?

Absolutely, says Showers. That is, she adds, if you want to make substantial changes and improvements in practice. The occasional two-hour lecture may be adequate for increasing teachers' knowledge certain subject. But to implement new teaching strategies, teachers the sustained, ongoing support of the coaching process. Without it, training efforts are largely in vain. And that's a proven fact.

IMPORTANT OUTCOMES

The research demonstrates several important outcomes of coaching.

First, coaching ensures that training will transfer. And not only do coached teachers actually use new strategies in their classrooms, they use them more often and more appropriately than uncoached teachers who learned the same strategies.

And that's where students benefit.

In one study, for example, teachers learned and were using Bruner's Concept Attainment strategy. The coached teachers' students were much better able to apply the Concept Attainment strategy independently to new material than the students of the uncoached teachers.

This "superior achievement" of the coached teachers' students was a "direct test of teachers' ability to teach a model to their students," Showers claims. And coaching was responsible for their success.

The research also shows that the coaches themselves benefit as they become "their own best students."

FAR REACHING EFFECTS

And it doesn't stop there.

"Implementation of a peer coaching program in a school has effects much more far reaching than the mastery and integration of new knowledge and skills for individual teachers," Showers claims. "The development of school norms that support the continuous study and improvement of teaching builds capability for any kind of change, whether it is adoption of a new curriculum, school-wide discipline policies, or the building of teaching repertoire. By building permanent structures for collegial relationships, schools can organize themselves for improvement in whatever area they choose."

Figure 1 Key Skills for Educational Assistance Personnel

and Description	Examples
rpersonal Ease. -lating to and directing others.	Very open person; nice manner; has always been able to deal with staff; knows when to stroke, when to hold back, when to assert; knows "which buttons to push"; gives individuals time to vent feelings, lets them know her interest in them; can talk to anyone.
2. **Group Functioning.** Understanding group dynamics, able to facilitate team work.	Has ability to get a group moving; started with nothing and then made us come together as a united body; good group facilitator; lets the discussion flow.
3. **Training/Doing Workshops.** Directing instruction, teaching adults in systematic way.	Gave workshops on how to develop plans; taught us consensus method with 5-finger game; prepares a great deal and enjoys it; has the right chemistry and can impart knowledge at the peer level.
4. **Educational General (Master Teacher).** Wide educational experience, able to impart skills to others.	Excellent teaching skills; taught all the grades, grade leader work, resource teacher; has done staff development with teachers; was always assisting, supporting, being resource person to teachers; a real master teacher; much teacher training work.
5. **Educational Content.** Knowledge of school subject matter.	Demonstrating expertise in a subject area; showed parents the value of play and trips in kindergarten; knows a great deal about teaching; what she doesn't know she finds out.
6. **Administrative/Organizational.** Defining and structuring work, activities, time.	Highly organized, has everything prepared in advance; could take an idea and turn it into a program; good at prioritizing, scheduling; knows how to set things up.
7. **Initiative-Taking.** Starting or pushing activities, moving directly toward action.	Assertive, clear sense of what he wanted to do; ability to poke and prod where needed to get things done; had to assert myself so he didn't step on me.
8. **Trust/Rapport-Building.** Developing a sense of safety, openness, reduced threat on part of clients; good relationship-building.	In 2 weeks he had gained confidence of staff; had to become one of the gang, eat lunch with them; a skilled seducer (knows how to get people to ask for help); "I have not repeated what they said so trust was built"; did not threaten staff; was so open and understanding that I stopped feeling uneasy.
pport. .oviding nurturant relationship, positive affec- ve relationship.	Able to accept harsh things teachers say, "It's OK, everyone has these feelings"; a certain compassion for others; always patient, never critical, very enthusiastic.
nfrontation. Direct expression of negative information, without generating negative affect.	Can challenge in a positive way; will lay it on the line about what works and what won't; is talkative and factual; can point out things and get away with being blunt; able to tell people they were wrong, and they accept it.
11. **Conflict Mediation.** Resolving or improving situations where multiple incompatible interests are in play.	Effected a compromise between upper and lower grade teachers on use of a checklist; spoke to the chair about his autocratic behavior and things have been considerably better; able to mediate and get the principal to soften her attitude; can handle people who are terribly angry, unreasonable; keeps cool.
12. **Collaboration.** Creating relationships where influence is mutually shared.	Deals on same level we do, puts in his ideas; leads and directs us, but as peers; doesn't judge us or put us down; has ideas of her own, but flexible enough to maintain the teachers' way of doing things too.
13. **Confidence-Building.** Strengthening client's sense of efficacy, belief in self.	She makes all feel confident and competent; doesn't patronize; "You can do it"; has a way of drawing out teachers' ideas; injects a great deal, but you feel powerful; makes people feel great about themselves, like a shot of adrenaline boosting your mind, ego, talents, and professional expertise.
14. **Diagnosing Individuals.** Forming a valid picture of the needs/problems of an individual teacher or administrator as a basis for action.	Realizes that when a teacher says she has the worst class, that means "I need help"; has an ability to focus in on problems; picks up the real message; sensitive, looks at teacher priorities first; knows when an off-hand joke is a signal for help.
15. **Diagnosing Organizations.** Forming a valid picture of the needs/problems of the school organization as a basis for action.	Analyzes situation, recognizes problems, jumps ahead of where you are to where you want to go; anticipates problems schools face when they enter the program; helped us know where we should be going; helped team look at the data in the assessment package.
16. **Managing/Controlling.** Orchestrating the improvement process; coordinating activities, time, and people; direct influence on others.	Prepared materials and coordinated our contact with administration and district; is a task master and keeps the process going; makes people do things rather than doing them himself.
source-Bringing. cating and providing information, materials, practices, equipment useful to clients.	He uses his network to get us supplies; brings ideas that she has seen work elsewhere; had the newest research, methods, articles, and ideas and waters them down for our needs.
18. **Demonstration.** Modeling new behavior in classrooms or meetings.	Willing to go into classrooms and take risks; modeling; showed the chair by his own behavior how to be more open.

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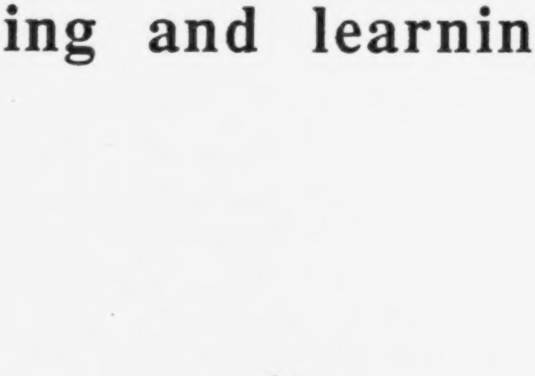
PEER COACHING GOALS

- Extend the workshop content into the classroom setting.

- Provide opportunities to observe colleagues in their classroom.

- Provide a process and forum for interaction regarding teaching and learning.



PEER COACHING
January, 1987

White Bear Lake School District 624

- Establish a voluntary peer group of 4-6 colleagues per building who have participated in an Elements of Instruction Workshop.

- Attend a one day workshop in January to learn observation and interaction techniques and review "Elements of Instruction" content.

- Form a peer coaching pair with one other member of the building peer coaching group.

- Observe and conference that member of the peer coaching group twice before mid-April, 1987.

- Be observed and conferenced by that member of the peer coaching group twice before mid-April, 1987.

- Meet with an elements trainer at least once to plan observation and feedback session.

- Attend a second 1/2 day workshop in mid-April to extend training and improve skills.

- Repeat the observation and conference cycle one more time before the end of May, 1987.

TIME RELEASE ARRANGEMENT FOR PEER - COACHING

- Provide substitutes
- Free teachers to observe other teachers by taking their classes
- Schedule larger than classroom size group instruction
- Arrange for independent study and research for students
- Organize team teaching
- Use audio or video tape equipment to record lessons for future analyzation

Tactic Implementation Planning Activity

1. **Select a tactic you might like to explore/implement.**

2. **Form a group of no more than four to plan a lesson design.**

3. **Read the sample strategy and classroom examples in the workbook.**

4. **As a group, design a lesson around the tactic.**

5. **Put on white paper.**

6. **Be prepared to share your ideas with the large group.**

ARE WE READY TO TEACH THINKING?

Directions

1. Answer the eight questions individually first.
2. Share your answers with your small group team.
3. As a total group team, compile one copy of question responses that reflects the consensus of the group.
4. Find a person on your team who will report back highlights of the discussion in your small group team.

Questionnaire

1. Why do we want to teach thinking?

2. What is it about our students that makes us think they need to learn to think?

3. What conditions are present in our school that makes this a good time to begin teaching for thinking? What indicators of readiness, desire and motivation exist?

4. What is the degree of our commitment? How much time, energy and resources are we willing to give?

5. What do we think human beings do when they are acting/behaving intelligently? Describe the vision of intelligent behavior for which we are striving.

6. What conditions must be created in our school to promote these intelligent behaviors?

7. What can we do to promote these intelligent behaviors?

8. What changes do we think it would take to install a thinking skills curriculum?

   a. Time allocations: How much time in the school day, week, or year should be given to thinking skills?

   b. Instructional materials?

   c. Curriculum materials, organization, and development procedures?

   d. Staffing?

   e. School organization?

   f. Assessment tools, techniques, and procedures?

   g. Teaching skills?

   h. Staff development?

   i. Other?

Questionnaire adapted from the work of Arthur Costa, Developing Minds, 1985.

ATTACHMENT F

Feedback Sheets

Thinking it over ...

I learned:
the concept-forming procedure

I liked ...
the way you kept checking back

and I ...
felt we covered a lot (in a good way) in the morning.

A problem I solved today was:

I would have liked: -
any information that applies to individualized, learner-directed learning

* * * * * *

I would like to know more about:
I would like tomorrow a chance to get together with my school team to discuss the implementation together

I am: optional
Name Nancy Knapp
School MSTC

I plan to:
~~to~~ improve my own thinking using these methods

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:
more about
concept
development

I liked ...
your style
of
presentation

and I ...
intend to
share
this
experience
(and materials)
with
colleagues

I would have liked:
more time to look over
materials ahead of
time

A problem I solved today was:
better
understanding
of thinking
in several
areas of
teaching/
learning

* * *

I would like to know more about:
right brain/
left brain
research
and
application

I am: optional
Name Rita Baltus
School Northcentral Tech. College
Wausau, WI 54401

I plan to:
study these
materials
more carefully;
reevaluate procedural
instructions;
allow students as many
options as possible

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

I liked ... immediate implimentation of ideas presented.

and I ...

I would have liked:

A problem I solved today was:

I would like to know more about:

I am: optional

Name Charles Cooley

School CVTC

I plan to:

Think about all this.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

that I don't know what a concept is.

I liked ...

your presentation style - you model effectively teaching very nicely

and I ...

appreciate that

A problem I solved today was:

verification of problem-solving focusing to make a decision

I would have liked:

More time

★ ★ ★ ★ ★ ★

I would like to know more about:

the math concepts you mentioned

I am: optional

Name Jan Lettings

School WCTC

I plan to:

work on integrating + sequencing

Critical thinking + creative thinking in the curriculum

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

Some great application

I liked ...

the entire day

and I ...

will continue to add to my knowledge base.

A problem I solved today was:

to better understand "concept"

I would have liked:

another whole day

* * *

I would like to know more about:

application process

Communication exercises for meeting Committee work

I am: optional

Name Florence [illegible]

School Chippewa Valley Technical College

I plan to:

direct infusing critical thinking throughout the nursing curriculum.

arrange state workshops for other nursing divisions.

incorporate processes into my response at meetings

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

I liked ...

and I ...

A problem I solved today was:

I would have liked:

I would like to know more about:

Statistics from follow-up studies. showing comparative student accomplishment.

I am: optional

Name ____________________

School ____________________

I plan to:

Better identify specific thinking skills for students in Gen Ed Classes.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I liked ...
All of the activities

and I ...
learned a little more about myself.

I learned:
Concepts.
More on task analysis
Be Specific

I would have liked:
More idea exchange time.
I am regretting that I missed the June seminar.

A problem I solved today was:
I think I created more than I solved!

* * *

I would like to know more about:
I'm still too "green" to this topic – need more on the whole thing!

I am: optional
Name Mary Colby
School MSTC

I plan to:
SQ3R the material to squeeze more info out! I am enthused and anxious to try these new (& renewed) ideas with my wide range of ABE Students.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned: that even tho I feel my classes are simple, I have made a lot of assumptions.

I liked ... the practical application of the information

and I ... sharing with the others.

A problem I solved today was:
helping my son
creative
use his critical
thinking skills
as an asset. -
Directing them

I would have liked: to have attended the workshop in June!

* * *

I would like to know more about:

I am: optional

Name Gale Jackson

School MSTC

I plan to: continue learning and training in this area to implement it at MSTC or in industry.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:
I am on the right track in my own thinking

I liked ...
the examples of concepts

and I ...
became more focused in my knowledge + ideas

A problem I solved today was:
I didn't quite know how the june material I Xerox'd from my colleagues fit.

I would have liked:
a bibliography for resource reference

I would like to know more about:
Critical thinking and other cultures

I am: optional

Name: Fay Shemchak

School: Lakeshore Technical College

I plan to:
develop a three credit course for my school

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I liked ...
you, your teaching methods
eye contact
content was excellent
my ABC group
your excercises for us.

and I ...

I learned:
much about thinking, how others think, how I think, characteristics of good thinking

I would have liked:
can't think of anything
(except milk instead of coffee)

A problem I solved today was:
well spent
great learning experience

★ ★ ★ ★ ★ ★

I would like to know more about:
apple cider was great
doughnuts were too

I am: optional
Name John Gunder
School Southwest Tech

I plan to:
take this back to my division & school and try to integrate

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned: new terms

I liked ...
Brainstorming

and I ...

A problem I solved today was:
thinking more clearly about thinking

I would have liked:
a little more time on each of the various areas.

I would like to know more about:
integrating into my teaching area

I am: optional

Name G. Erickson

School UUTC

I plan to:
use this material in future curriculum development.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:
of resources which will better help me to conceptualize the steps (stages) of learning

I liked ...
hearing about perceptions which gave insights into my own experiences — making sense of them

and I ...
felt reinforced functioning in the Teaching style I use.

I would have liked:

A problem I solved today was:

I would like to know more about:

I am: optional
Name Jill Tallman
School CVTC

I plan to:
— Be here Tomorrow
— Work c̄ my (also) co-workers here in deciding how to infuse this to the rest of the faculty.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

concepts

I liked ...

most of the exercises presentation (better than last summe)

and I ...

am surprised how much of what learned last summer using already

I would have liked:

A problem I solved today was:

how to approach orientation to new course

I would like to know more about:

① teaching concepts
② relationship critical thinking skills & self concept

I am: optional

Name ________________

School ________________

I plan to:

continue to try to push faculty toward critical thinking skills as part of curriculum

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:
SOME VERY- BASIC AND UNDERSTANDABLE BACKGROUND ON THINKING AND-HOW TO- BRING IT TO CLASSROOM INSTRUCTION

I liked ...
THE OPPORTUNITY- TO- BE ALLOWED- TO GIVE MY- COMMENTS-

and I ...
LIKED THE OPPORTUNITY- TO INTERACT WITH OTHER WORKSHOP- PARTICIPANTS

A problem I solved today was:
VERY- STIMULATING SINCE IT- REINFORCED- AND CLARIFIED SOME OF DOUBTS I HAD ABOUT TEACHING THINKING SKILLS

I would have liked:
HAVE HAD- A- OPPORTUNITY TO HAVE A BIBLIOGRAPHY OF GOOD RESOURCES TO- ADDRESS PROBLEM-SOLVING ACTIVITIES THROUGH THINKING SKILLS

* * *

I would like to know more about:

I am: optional
Name G. Munyon
School CEBAHIB

I plan to:
TRY TO USE WHAT I LEARNED IN MY- FUTURE IN-SERVICE AND WORKSHOP- CONTENT FOR MY- VOC EDUCATION TEACHERS IT WILL STIMULATE ME TO RESEARCH MORE ABOUT THINKING SKILLS.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

- About concepts
- attributes of critical thinker

I liked ...

content and delivery of workshop topics, and this evaluation form —

and I ...

thought is was extremely worthwhile! Nice job!

A problem I solved today was:

understanding some of the attitudes we can help develop in very young children (and why we should)

Good videotape

I would have liked:

* * *

I would like to know more about:

motivating/enthusing instructors — getting them to be committed

I am: optional

Name Ingrid Huebner

School Waukesha County Tech. College

I plan to:

use all this information as background for developing the instructor inservice I spoke to you about.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

It was great

I learned:

more techniques

I liked ...

the movement & tasks addressed by groups

and I ...

become more comfortable with others that I didn't know

I would have liked:

A problem I solved today was:

enjoyable
productive
stimulating

* * * * * *

I would like to know more about:

1. the how-to-implement
2.

I am: optional

Name ______________

School ______________

I plan to:

work more on the acceptance of the importance of a structure to the teaching of critical thinking in programs.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

how much I get to learn.

I liked ...

the practical orientation.

and I ...

admire the expertise

A problem I solved today was:

I would have liked:

I plan to:

I would like to know more about:

I am: optional

Name ______________

School ______________

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

Concept development

I liked ...

the well developed materials and the flow of the presentation!

and I ...

I would have liked:

A problem I solved today was:

Better able to accept what has, to this point in my life ~~as~~ looked like overly holistic thinking, as in actuality a far more creative process.

* * * * * *

I would like to know more about:

I am: optional

Name ________________

School ________________

I plan to:

Implement all that I will have gained from the w/s in my responsibilities in planning, development & evaluation.

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I liked ...

working together in small groups

and I ...

learned from each person

I learned:

much more about thinking

I would have liked:

A problem I solved today was:

fear of talking with other staff

I would like to know more about:

concepts

I am: optional

Name ______________

School ______________

I plan to:

try these skills when I return

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

Teaching of thinking requires the teacher to directly instruct the student in the process

I liked ...

the group interaction

and I ...

felt you let everyone contribute with minimum domination of the conversation

A problem I solved today was:

I would have liked:

to have read more on the topic before coming to the conference.

I would like to know more about:

how integrating this into the curriculum would affect the performance of average to low functioning students with at least average abilities

I am: optional

Name Ronald Oppenoll

School SWTC

I plan to:

Design a model for use in a counseling situation

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

Thinking it over ...

I learned:

Alot
a
enjoyed

I liked ...

Concept attainment
or
" development

and I ...

A problem I solved today was:

what is
A
Concept a
How to teach
development of

I would have liked:

I would like to know more about:

application

I am: optional

Name ______________

School ______________

I plan to:

Use reverse side for additional comments and suggestions. Thank you!

Adapted from a form developed by Sidney L. Hahn, University of Nebraska at Lincoln 1985

ATTACHMENT G

Evaluation Rating Scales

Thinking Skill

– January 1989

VTAE –

```
DISAP, Version 2.0, RSTS V9.6-11 TCSC Bashful. Program: DES101     Page: 1
Center for Vocational Technical and Adult Education
Group numbers based on the PRIMARY group for this analysis
 alysis on 02-Jun-89 at 11:44 AM.  Data from file: TSWHL9
 rvey analysis of response to 17 questions, by 24 people
============
Question: 1
============
 Group ---- Mean ----   --- Stand Dev ---   --- Number ---   ------ Quartile ------
        Omit  No Omit      Omit    No Omit    People   Checks First Median Third IQR
   0    4.88   4.88        0.34     0.34        24       24   4.64  4.93   5.21 0.57

 Omit    1    2    3    4    5
 0.00 0.00 0.00 0.00 0.13 0.88 People
    0    0    0    0    3   21

============
Question: 2
============
 Group ---- Mean ----   --- Stand Dev ---   --- Number ---   ------ Quartile ------
        Omit  No Omit      Omit    No Omit    People   Checks First Median Third IQR
   0    4.63   4.63        0.65     0.65        24       24   4.30  4.79   5.15 0.85

 Omit    1    2    3    4    5
 0.00 0.00 0.00 0.08 0.21 0.71 People
    0    0    0    2    5   17

============
Question: 3
============
 Group ---- Mean ----   --- Stand Dev ---   --- Number ---   ------ Quartile ------
        Omit  No Omit      Omit    No Omit    People   Checks First Median Third IQR
   0    4.71   4.71        0.46     0.46        24       24   4.36  4.79   5.15 0.79

 Omit    1    2    3    4    5
 0.00 0.00 0.00 0.00 0.29 0.71 People
    0    0    0    0    7   17

============
Question: 4
============
 Group ---- Mean ----   --- Stand Dev ---   --- Number ---   ------ Quartile ------
        Omit  No Omit      Omit    No Omit    People   Checks First Median Third IQR
   0    4.33   4.33        0.64     0.64        24       24   3.83  4.33   4.90 1.07

 Omit    1    2    3    4    5
 0.00 0.00 0.00 0.08 0.50 0.42 People
    0    0    0    2   12   10

============
Question: 5
============
 Group ---- Mean ----   --- Stand Dev ---   --- Number ---   ------ Quartile ------
        Omit  No Omit      Omit    No Omit    People   Checks First Median Third IQR
   0    3.67   4.00        1.78     0.69        24       24   3.54  4.00   4.46 0.92

 Omit    1    2    3    4    5
 0.08 0.00 0.00 0.21 0.50 0.21 People
    2    0    0    5   12    5
```

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```
DISAP, Version 2.0, RSTS V9.6-11 TCSC Bashful. Program: DES101      Page: 2
Center for Vocational Technical and Adult Education
Group numbers based on the PRIMARY group for this analysis
Analysis on 02-Jun-89 at 11:44 AM.  Data from file: TSWHL9
   vey analysis of response to 17 questions, by 24 people
  ==========
Question: 6
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
         Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     3.83   3.83       0.82      0.82       24      24  3.21  3.86   4.41  1.19

 Omit    1     2     3     4     5
 0.00 0.00 0.04 0.29 0.46 0.21 People
    0     0     1     7    11     5

============
Question: 7
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
         Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     2.21   2.21       1.02      1.02       24      24  1.58  2.04   2.50  0.92

 Omit    1     2     3     4     5
 0.00 0.21 0.54 0.13 0.08 0.04 People
    0     5    13     3     2     1

============
Question: 8
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
         Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     4.54   4.54       0.66      0.66       24      24  4.07  4.70   5.10  1.03

 Omit    1     2     3     4     5
 0.00 0.00 0.00 0.08 0.29 0.63 People
    0     0     0     2     7    15

============
Question: 9
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
         Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     4.71   4.71       0.46      0.46       24      24  4.36  4.79   5.15  0.79

 Omit    1     2     3     4     5
 0.00 0.00 0.00 0.00 0.29 0.71 People
    0     0     0     0     7 [illegible]

============
Question: 10
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
         Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     4.75   4.75       0.44      0.44       24      24  4.50  4.83   5.17  0.67

  mit    1     2     3     4     5
 0.00 0.00 0.00 0.00 0.25 0.75 People
    0     0     0     0     6    18
```

```
DISAP, Version 2.0, RSTS V9.6-11 TCSC Bashful. Program: DES1C      Page: 3
Center for Vocational Technical and Adult Education
Group numbers based on the PRIMARY group for this analysis
 alysis on 02-Jun-89 at 11:44 AM.  Data from file: TSWHL7
  ves analysis of response to 17 questions, by 24 people
============
Question: 11
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
        Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     4.46   4.46      0.59     0.59      24      24   3.95  4.50   5.00  1.05

 Omit    1    2    3    4    5
 0.00 0.00 0.00 0.04 0.46 0.50 People
    0    0    0    1   11   12

============
Question: 12
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
        Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     4.88   4.88      0.34     0.34      24      24   4.64  4.93   5.21  0.57

 Omit    1    2    3    4    5
 0.00 0.00 0.00 0.00 0.13 0.88 People
    0    0    0    0    3   21

============
Question: 13
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
        Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     4.25   4.43      1.45     0.66      24      24   3.92  4.54   5.07  1.10

 Omit    1    2    3    4    5
 0.04 0.00 0.00 0.08 0.38 0.50 People
    1    0    0    2    9   12

============
Question: 14
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
        Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     2.33   2.43      1.49     1.31      24      24   1.32  2.25   3.35  2.03

 Omit    1    2    3    4    5
 0.04 0.29 0.25 0.21 0.13 0.08 People
    1 [illegible] 6    5    3    2

============
Question: 15
============
 Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
        Omit  No Omit     Omit   No Omit   People  Checks First Median Third IQR
   0     1.71   1.71      0.81     0.81      24      24   1.00  1.50   2.36  1.36

 Omit    1    2    3
 0.00 0.50 0.29 0.21 People
    0   12    7    5
```

```
SISAP, Version 2.0, [illegible]
Center for Vocational Technical and Adult Education [illegible]      Page: [illegible]
Group numbers based on the PRIMARY group for this analysis
Analysis on 02-Jun-89 at 11:44 AM.  Data from file: TSURV
  way analysis of response to 17 questions, of 24 people
===========
Question: 16
============
Group ---- Mean ----  --- Stand De. ---  --- Number ---  ------ Quartile ------
        Omit  No Omit    Omit   No Omit   People  Checks First Median Third IQR
  0 .   4.29   4.29      0.69      0.69     24      24    3.85  4.29   4.83  0.98
Omit    1    2    3    4    5
0.00 0.00 0.04 0.00 0.58 0.38 People
 . 0    0    1    0    14   9
============
Question: 17
============
Group ---- Mean ----  --- Stand Dev ---  --- Number ---  ------ Quartile ------
      Omit  No Omit    Omit   No Omit   People  Checks First Median Third IQR
 0    4.67   4.67      0.48    0.48      24      24    4.25  4.75   5.13  0.88
Omit    1    2    3    4    5
0.00 0.00 0.00 0.00 0.33 0.67 People
  0    0    0    0    8   16
```

4.1 overall average

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ATTACHMENT H

Participant Comments

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 18 - Ann Mielke

1. Excellent presentation and group rapport.
2. Excellent information.
3. Good information - I felt she could have covered it more briskly.
4. Liked the practical applications.
5. Really imprinted it better second time around, as well as expanded it.
6. Actual experiences and beliefs shared.
7. Felt like I was taking her course in one day.
8. Very good materials provided.
9. One day was not enough time to cover all the types of critical/creative tools - need to bring the examples more in line with reality.
10. I'm very grateful for the very specific work that Ann has done in this area and even more so her willingness to share the 61 behaviors that demonstrate competencies in critical creative thinking.

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 19 - Kathy Kelly

1. Excellent presentation and group rapport.
2. Approach and presentation "top notch" - excellent information.
3. Very talented presenter and lots of good information.
4. Extremely enlightening.
5. Much improved presentation over last summer. More emphasis on how tos and principles versus exercises in thinking.
6. Fluent, fun, challenging, forcing us to relate to individual situations, personable.
7. Great job.
8. Very good in all aspects.
9. Excellent presenter - "reads" her audience well. Makes very smooth transitions between subjects. Good contact very adequately explained.
10. Kathy modeled effective teaching techniques beautifully and handled the large group so well. She gave me many ideas for presentations and inservice for our own teachers and administrators.

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 20 - What did you like best about the workshop?

1. Stimulation by presentations. Working with other VTAE colleagues.
2. The continuity.
3. The stimulating content - the interactions between participants - the nice way we were drawn into the procedure.
4. Kathy Kelly's presentation.
5. Group interaction.
6. Application.
7. The fact that it followed the last one - gave ideas a chance to become familiar.
8. Usable in formation.
9. The practicality of the ideas.
10. Organization - useful - other participants.
11. Good strong presenters, good materials for distribution.
12. Fast paced, to the point, top presenters, good information.
13. Excellent topic, will help alot.
14. Techniques, sharing of ideas on "how to", "comfort" level.
15. Implementation of strategies.
16. Hard to say - I enjoyed it all.
17. Practical orientation. Solid materials.
18. Enthusiasm of the instructors.
19. Good gathering and organization of material.
20. The handouts were very helpful - liked having nice bibliographics to refer to. Also, chance to discuss how we were going to implement it.
21. The quality of the presenters.

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 21 - How could the workshop be improved?

1. Follow-ups.
2. It was great! Keep building.
3. More time at the end to work in our district teams.
4. Separate the attendees from the earlier session so they didn't have so much repetition.
5. Not have spent so much time on repetition.
6. More time (1 Hour) for teams to plan future strategies in own institutions.
7. I always seem to need more time.
8. Would have liked individual who spoke on Friday a.m. last summer, return.
9. o.k.
10. More heat in rooms.
11. Be more specific to Voc. Ed.
12. Fewer cutesy games.
13. Develop some more effective overheads or don't use them at all. If they are not helpful they are very distracting.
14. I should have brought curriculum materials to draw from and to look for examples.

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 22 - Workshop facilities.

1. Cold - Otherwise good.
2. Good - A bit cool.
3. Fine
4. Good - Chairs Uncomfortable.
5. Good
6. Cold - Good Food.
7. Excellent
8. Good - Building a little cool.
9. o.k.
10. It was to me a lot too cool in the rooms.
11. Cool - COLD - Otherwise o.k.
12. Rooms Too Cold.
13. Good
14. Cold
15. Excellent
16. o.k.
17. Great - Very clean
18. Excellent
19. Good
20. Good
21. Comfortable rooms for presentations, excellent lunch facility.
22. Fine - but for parking.

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 23 - Overall workshop organization.

1. Great
2. Excellent
3. Great! Very easy to attend, with maps, agendas, list of motels, etc.
4. Good
5. Good
6. Good
7. Excellent
8. They are always well organized.
9. Good
10. Excellent
11. Excellent - More lead time regarding notification would have been helpful.
12. Very well done - All staff were great.
13. Mornings are a little long.
14. Great
15. Excellent
16. o.k.
17. Excellent
18. Excellent
19. Good
20. Wonderful overall planning and delivery of entire conference.
21. Very good

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 24 - What other topics would you like addressed for future workshops?

1. Other staff development experiences, inservice staff development experiences.
2. Build on what we've done - bring examples.
3. Teaching thinking to learning disabled students.
4. Feedback on this workshop.
5. Special needs.
6. Would like Stout to become the clearing house or driving force to keep the network of individuals at this conference connected and aware of each other's progress.
7. Critical thinking and other cultures.
8. Still shaky on "concepts"
9. How to "coach" for change.
10. Procedures for staff development and curriculum development in regards to thinking (on-site).
11. In-depth work, curriculum development.

JANUARY 1989 THINKING SKILLS WORKSHOP

Comments - Question 25 - Other Comments.

1. To think I might have missed this. I have to think about how to catch up with my regular work.
2. Thank you!
3. This workshop was well planned - It was very good!
4. The lunch planning was smart. Quick, yet individualized. The materials from June should have been mailed to new participants a couple of weeks ahead so they could catch up.
5. I do not like the "insult" of being told to sit next to someone I do not know. I am an adult educator and can very capably network on my own. Thank you.
6. As normal, it was good to be back at Stout.
7. Afternoon could be restructured - lunch, breaks and ending.
8. Excellent Workshop - Keep up the good work!
9. Excellent organization of workshop. Kathy Kelly is terrific!
10. Very good job - one of the best overall workshops I've attended.